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Sonic utopia and social dystopia in the music of Hendrix, Reznor and Deadmau5

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Sonic Utopia and Social Dystopia in the Music of Hendrix, Reznor and Deadmau5

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For my parents, Jack and Rose.

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Sonic Utopia and Social Dystopia in the Music of Hendrix, Reznor and Deadmau5

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ABSTRACT

Twentieth-century popular music is fundamentally associated with electronics in its creation and recording, consumption, modes of dissemination, and playback. Traditional musical analysis, placing primacy on notated music, generally focuses on harmony, melody, and form, with issues of timbre and postproduction effects remaining largely unstudied. Interdisciplinary methodological practices address these limitations and can help broaden the analytical scope of popular idioms.

Grounded in Jacques Attali's critical theories about the political economy of music, this dissertation investigates how the subversive noise of electronic sound challenges a controlling order and predicts broad cultural realignment. This study demonstrates how electronic noise, as an extra-musical element, creates modern soundscapes that require a new mapping of musical form and social intent. I further argue that the use of electronics in popular music signifies a technologically-obsessed postwar American culture moving rapidly towards an online digital revolution. I examine how electronic music technology introduces new sounds concurrent with generational shifts, projects imagined utopian and dystopian futures, and engages the tension between

automated modern life and emotionally validating musical communities in real and virtual spaces.

Chapter One synthesizes this interdisciplinary American studies project with the growing scholarship of sound studies in order to construct theoretical models for popular music analysis drawn from the fields of musicology, history, and science and technology studies. Chapter Two traces the emergence of the electronic synthesizer as a new sound that facilitated the transition of a technological postwar American culture into the politicized counterculture of the 1960s. The following three chapters provide case studies of individual popular artists' use of electronic music technology to express societal and political discontent: 1) Jimi Hendrix's application of distortion and stereo effects to narrate an Afrofuturist consciousness in the 1960s; 2) Trent Reznor's aggressive industrial rejection of Conservatism in the 1980s; and 3) Deadmau5's mediation of online life through computer-based production and performance in the 2000s. Lastly, this study extends existing discussions within sound studies to consider the cultural implications of music technology, noise politics, electronic timbre, multitrack audio, digital analytical techniques and online communities built through social media.

TABLE OF CONTENTS

CHAPTER ONE - SOUND STUDIES: AN INTERDISCIPLINARY APPROACH TO MUSIC AND ELECTRONICS

Twentieth-century popular music is fundamentally associated with electronics in its creation, recording, consumption, modes of dissemination and playback, and this relationship between music and technology has been the focus of an increasing amount of scholarship over the past fifteen years. Music historians Trevor Pinch and Frank Trocco point to the uniqueness of the synthesizer, which uses an electric signal rather than acoustics, in arguing for its revolutionary impact on twentieth century music.[1] In *The Poetics of Rock: Cutting Tracks, Making Records,* musicologist Albin Zak chooses to focus on "recordists," rather than musicians.[2] While most analysis references chords or lyrics, Zak breaks a musical "track" into five components: musical performance, timbre, echo, ambience, and texture, including important distinctions between a room's ambient reverberations and the purely mechanical effect of adding echo. It is a different way of thinking about music that considers the process as more production than performance.

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[1] Trevor Pinch and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge, MA: Harvard University Press, 2002).

[2] Albin Zak, *The Poetics of Rock: Cutting Tracks, Making Records* (Berkeley and Los Angeles: University of California Press, 2001). This shift is meaningful in that it considers the permanent sound recording as the essential musical document rather than the typically privileged written score, lyrical content, or harmonic arrangement. It also extends the musical conversation beyond songwriters and performers to engineers and producers, as well as the recording and mixing tools used in making a record.

Still, the layers of electronic technology that are integral to music's existence remain the least studied or understood aspect of music making.

In this dissertation, I argue that the growing presence of electronics in popular music signifies a technologically-obsessed postwar industrial culture moving rapidly toward an online digital revolution. Using a case study approach, each chapter is centered around a popular artist and selected electronic technology that informs their work, beginning in the 1950s with the invention of electronic instruments, such as Robert Moog's synthesizers, through electronic dance music producer Deadmau5's use of computerized technology to create a soundtrack for online digital culture. Employing new theoretical models from the fields of history, musicology, and sound studies, and approaching this topic from an interdisciplinary American studies perspective, I will demonstrate how this electronic "noise," as an extra-musical element, impacts cultural history and creates modern soundscapes that require a new mapping of musical form and intent. Lastly, I will extend the discussion toward digital analytical techniques made possible by computerized multitrack audio files, which have both an alternative and analogous relationship to the traditional written score or commercial recording.

My theoretical framework departs from French economist Jacques Attali's *Noise: The Political Economy of Music*. Attali sees in music the constant battle between a controlling "order" and a subversive "noise," which he believes can inspire a shift in the direction of society. Attali refers to "the political economy of music as a succession of orders done violence by noises that are prophetic because they create new orders,

unstable and changing."[3] In his foreword to the book, literary theorist Fredric Jameson points out that Attali was the first to go beyond Marxist constructions of the reactive superstructure model to say that music, by its prescient nature, may actually be able to "anticipate historical developments, to foreshadow new social formations."[4] Attali makes an intriguing proposition, "not only to theorize *about* music, but to theorize *through* music."[5] He argues that music presents a new theoretical model that can be useful for understanding how society organizes noise and creates order. Music becomes a mirror for society, reflecting its vibrations and signs in a fluid, evolving manner. As cultural shifts are predicted through noise, music becomes, "prophetic… a herald of times to come."[6]

Attali's thesis is that music evolves through a cycle of transformation from its original ritualistic usage, deeply connected to social function and the body, into a commercial product—packaged, reproduced, and replicated until it becomes devoid of meaning. He proposes that music has continuously undergone constant cycles of reordering that prefigure larger cultural shifts. In his view, music carries a supreme power to control history through its ability to make society forget the past, believe in the

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[3] Jacques Attali, *Noise: The Political Economy of Music* (Minneapolis: University of Minnesota Press, 1985), 5.

[4] Fredric Jameson, foreword to *Noise: The Political Economy of Music*, by Jacques Attali, xi.

[5] Attali, 4.

[6] Ibid.

harmony of the status quo and silence opposing voices.[7] The pendulum will swing to the subversive side of music when the placating qualities of mass-produced culture cannot withstand the pressures of a revolutionary force that demands a new social order. The new noise will supplant the old and enter into the same three stages of power until the cycle again repeats. The most heavily electronic styles from industrial to hip-hop directly challenge a hegemonic system of oppression and control over information. The arrival of a new musical technology, and its unfamiliar sound, should herald a shift in the ordering of society under Attali's theoretical framework. I suggest that electronic technology has provided the evolutionary noise that reflects cultural shifts into the digital age. Applying Attali's theoretical model, I argue here that popular music was prescient about society's online future.

According to Attali, "In music, the instrument often predates the expression it authorizes, which explains why a new invention has the nature of noise."[8] American studies and electric guitar scholar Steve Waksman is in agreement, commenting that "few have noted the crucial role played by musical instruments in his [Attali's] theoretical framework."[9] Instruments indeed factor into music's prophetic power by engineering new noises. While Waksman has paid particular attention to the cultural role of the

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[7] Attali, 19.

[8] Attali, 35.

[9] Steve Waksman, *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience* (Cambridge, MA: Harvard University Press, 1999), 9.

electric guitar in his enlightening *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience*, I would propose a larger focus on electronic technology for having a similar, but less heralded, impact.

Waksman begins *Instruments of Desire* with the infamous moment in 1965 when Bob Dylan "plugs in" at the Newport Folk Festival. Waksman is careful in noting that by raising music's volume level, the amplified electric guitar created intense upheaval, but also normalized a new standard sound for pop music over time. The guitar is the first major crossover electronic-based instrument and serves as a reference point for later electronic experimentation. It would appear that electronic music has been largely influenced by the development of the electric guitar and amplification. Guitarists were some of the first to appreciate and utilize the possibilities of electronic manipulation, popularizing distortion as a tone color as early as the 1930s.[10]

The electric guitar is a hybrid electronic instrument. Although magnetic pickups translate a vibration into electrical information carried through a cord into the amplifier, the guitar is still played in the same fashion as its acoustic counterpart. It also features similar attack, sustain and decay properties pertaining to the notes played. The guitar looks, feels and translates as an instrument, whereas a series of metal boxes littered with wires and control knobs is unfamiliar. Synthesizers do not need to feature the same

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[10] Dave Hunter, *Guitar Effects Pedals: The Practical Handbook* (San Francisco: Backbeat Books, 2004), 20. Early pioneers of distortion on guitar include jazz guitarist Charlie Christian in the late 1930s, Ike Turner's guitar on "Rocket 88" (1951), and the Kinks' Ray Davies experimental sound on "You Really Got Me" (1964).

acoustic properties found in most instruments even if they are often rigged with a familiar keyboard controller. Electronic instruments operate on a different framework capable of sustaining notes indefinitely or having no sonic capabilities if left unplugged. Waksman's research, centered around the electric guitar, is a starting point to further discuss other electronic or hybrid instruments.

Synthesist Wendy (then Walter) Carlos's 1968 release, *Switched-On Bach*, marked the synthesizer's crossover among a popular audience. Until this point, the synthesizer had been a tool for exploration by avant-garde composers and experimental music studios. Carlos put the new technology into musical practice and initiated an intense discussion about musical aesthetics over her electronic reinterpretations of Bach. Still, Carlos was recording pre-composed material, and it could be asked if the synthesized versions of Bach constituted something different, since, in essence, the score remained fundamentally the same, no different than one of Segovia's transcriptions of a Bach cello suite for classical guitar. In short, if viewed only through the musical score, rather than the recording, the music would appear the same as Bach's composition. The affirmative answer that Carlos' performance signaled a change in musical practice lies in the origins of the electronic sound source that was creating fundamentally new timbres. *Switched-On Bach* was a familiar work set in a radically different and modern language. The sound paralleled Carlos's extreme gender reassignment measures. Personally and musically, Carlos illustrated the ability to re-contextualize and ultimately re-identify oneself.

In *Analog Days: The Invention and Impact of the Moog Synthesizer*, Trevor Pinch and Frank Trocco document a unique moment when music and technology realign to break new cultural ground. The authors trace the origins of the synthesizer from Robert Moog's basement workshop through the revolutionary impact of the synthesizer, within the context of the tumultuous 1960s, via recorded music like Carlos' *Switched-On Bach* and the live performance theatricality of rock synthesist Keith Emerson. However, the authors may have missed a vital connection between the synthesizer and the postwar technological obsessions of the 1950s, especially its ties to science-fiction and film. Pinch and Trocco privilege the analog synthesizer and the electric guitar as the two most significant new instruments of the twentieth century. They go as far as to suggest that, "In the long run the synthesizer may turn out to be the more radical innovation, because, rather than applying electricity to a pre-existing instrument, it uses a genuinely new source of sound—electronics."[11] Pinch and Trocco's insight about an unprecedented source of sound suggests that a new social structure will manifest itself and the synthesizer will play a prominent role in its actualization. It signals a realignment of an electronically innovative culture with noise. Pinch and Trocco's intuition about the synthesizer can be extended towards understanding a postwar American culture obsessed with rapid technological advancement.

Music and interdisciplinary studies scholar Paul Théberge also views the electric guitar (but not the synthesizer) as a hybrid instrument in his survey of digital

[11] Pinch and Trocco, 7.

instruments, *Any Sound You Can Imagine: Making Music/Consuming Technology*.[12] Théberge extends the world of digital instruments to the sampler, a device that allows small bits of prerecorded material to be rearranged and manipulated in a sound collage. He asserts that digital instruments are breaking down the barriers between performance and reproduction, as prerecorded and sampled sounds are increasingly becoming used as unique musical instruments. The advent of recording has then opened up an entirely new spectrum of available sound. According to Théberge, digital instruments define a completely new approach to music making from traditional instruments and lean toward a production model in ways similar to what Albin Zak documents in his *The Poetics of Rock*. Electronic musicians increasingly think of themselves as musical producers rather than players and consequently think about music in terms of production and programming rather than performance, in which production is akin to composition.

The idea of music programming, rather than performing, falls in line with the inclusion of technology glitches into electronic music. Sound and contemporary art scholar Caleb Kelly surveys making music from the unintended errors of playback devices and digital technology in *Cracked Media: The Sound of Malfunction*. This genre is known as glitch music, referring to the digital skips resulting from gaps in binary code. Kelly calls glitch "a key marker in the development of digital arts practices," representing

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[12] Paul Théberge, *Any Sound You Can Imagine: Making Music/Consuming Technology* (Hanover: Wesleyan University Press, 1997), 52-54.

a shift toward computer-based art.[13] Central to the idea of glitch is the "crack," or break from the original sound or purpose into an unknown realm of possibilities. Kelly points out that the crack has a two-fold meaning referring to the physical breaking or cracking of a disc, but also to cracked software. To crack, in the digital world, means to strip off built-in copyright protections and allow piracy.

Online music sharing and legal debates over copyright were fueled by an explosion in internet-based music piracy, which laid the groundwork for a new free content model based on modes of peer-to-peer file-sharing. Kelly centers his investigation around avant-garde contemporary artists, claiming cracked media's assimilation into the mainstream diluted the movement. Rather, I argue that studying mainstream acts like industrial rock band Nine Inch Nails (NIN), and NIN creator Trent Reznor's early embrace and promotion of websites, social networking, and leaked content, from the early 1990s to the present, allow for a deeper and more complex understanding of today's internet culture. Using the GarageBand platform (bundled within Apple's OS X and iOS) Reznor facilitates content distribution and a remix culture built around his group Nine Inch Nails in which fans freely remix his music using the GarageBand digital audio workstation and upload their creations to the band's website.

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[13] Caleb Kelly, *Cracked Media: The Sound of Malfunction* (Cambridge: MIT Press, 2009). Kelly makes light of the "new electronic musician" that resulted from the glitch movement, "The cliché of the period, roughly 1994-2000, was the image of the bedroom producer hunched over a desktop computer trying various methods to overload its central processing unit to produce a new digital tick, pop or clip that could be sampled and then sequenced for the next track," 7-8.

The glitch follows a linear history not only in terms of computer instruments, but also to the social culture of online free distribution. In short, the interface between digital files of music and the user, or listener, has disrupted the fundamental premises and hierarchies of composer and listener.

As musicians auto-tune their voices to sing over virtual instruments, record to digital audio workstations and compress their files into an mp3 form to be purchased or streamed via the internet, the process of music making has become digitized on all levels. This study engages the dramatic shift in music production, composition, consumption and ownership in the digital age. These developments in the field of music illustrate the need for new musical models that consider programmed musical production, cultural reception and online media.

A pronounced and sustained interest in both popular music and sound studies in the field of musicology and music theory underline a change in methods. Traditional musical analysis, placing primacy on notated music, has generally prioritized harmonic, melodic, and formal analysis, but rarely timbre or sound. Analysis, however, is at the most fundamental level a quantitative reflection on sound, and requires an interpretation by both the author and reader. Given that popular music composition is generated through oral, not written means, traditional music analysis falls short of offering a persuasive analytical account of popular music composition. Instrumentation can be graphically laid out on a musical score for analysis of melody, harmony, rhythm and form. However, this approach has shown its limitations when new instruments replace

traditional acoustic instruments, such as the case of Carlos's Bach reworkings for synthesizer. Rather, twentieth-century popular music, especially electronic-based genres, is a densely layered musical language that has evolved through the influence of mechanical noise and the introduction of electronics. The score has no way of describing the ambient synthetic textures, static distortions, or embedded samples that are fundamental to current popular styles. Nor can a traditional score capture the audience response generated by a sweep-filtered beat loop or a creative remix when performed live, a consideration that is central to composers working in this genre. We must continue to seek out new models and modes of discourse, as the soundscape evolves.

The field of sound studies has already contributed to a new consideration about the importance of sound, and has produced a multitude of alternate analytical methods, from quantitative studies of vibrations, acoustics and sound-waves, to qualitative dimensions such as the hearing of the audience, mobility, and cultural impact, among others. Significantly, the field of sound studies is informed by work from a variety of areas that take into account context, geography, technology, acoustics, space, and physical hearing, among other topics, areas of concern that are invisible in the notated score.

Perhaps the traditional reluctance to engage with sound on the same level as in visual culture is that sound is evanescent, existing, always, in "real time." Even the most permanent representation, the recording, is mediated by the technologies of playback equipment, the acoustics of the space, hearing position, and the uniqueness of individual

capacities for hearing. This accounts for many in the field of sound studies to favor the term "transduced," an acknowledgement that sound must always be converted for perception when considering how sound is received as a sensory experience.[14] In the case of recorded music, sound has also become a commodity that is sold, bought, regulated, and mined for data.

Sound studies is now both a methodology and a field, as Jonathan Sterne, writes: "*Sound studies* is the name for the interdisciplinary ferment in the human sciences that takes sound as its analytical point of departure or arrival."[15] Other notable voices in the sound studies field, Trevor Pinch and Karin Bijsterveld initially defined sound studies as, "an emerging interdisciplinary area that studies the material production and consumption of music, sound, noise, and silence and how these have changed throughout history and within different societies."[16] Pinch and Bijsterveld chose to organize *The Oxford Handbook of Sound Studies* by a focus on science, technology, and medicine. In the introduction, they confirm their original definition, while noting that what they called "emerging" has become a "vibrant new interdisciplinary field," with contributions from "acoustic ecology, sound and soundscape design, anthropology of the senses, history of

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[14] Trevor Pinch and Karin Bijsterveld, "New Keys to the World of Sound," *The Oxford Handbook of Sound Studies*, ed. Trevor Pinch and Karin Bijsterveld, (Oxford: Oxford University Press, 2011), 2.

[15] Jonathan Sterne, "Sonic Imaginations," *The Sound Studies Reader*, ed. Jonathan Sterne, (New York: Routledge, 2012), 2.

[16] Trevor Pinch and Karin Bijsterveld, "Sound Studies: New Technologies and Music," *Social Studies of Science* 34, no.5 (Oct 2004): 635-648.

everyday life, environmental history, cultural geography, urban studies, auditory culture, art studies, musicology, ethnomusicology, literary studies, and science and technology studies."[17]

Sterne, Pinch and Bijsterveld echo that sound studies is ideally an interdisciplinary dialogue, drawing on a range of approaches that turn the critical ear toward the power of sound in society. Sterne's first principle of sound studies is that there is no "… privileged group of methodologies for sound studies. Instead, sonic imaginations are guided by an orienting curiosity, a figural practice that reaches into fields of sonic knowledge and practice, and blends them with other questions, problems, fields, spaces and histories."[18] As Sterne intimates, "Sound studies is academic, but it can also move beyond the university… It may *think sonically* as it moves underwater, through the laboratory or into the halls of government… It is a global phenomenon as well."[19] He points out that "sound students" are typically something else as well. The premise suggests an openness to dialogue between many areas of thought while remaining curious about sound, rather than defining a new discipline with its own theoretical foundation already established.

Sound studies thus opens up as a fascinating space for evolving thought centered on the aural, and a few examples of existing work in the field demonstrates a breadth of

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[17] Pinch and Bijsterveld, *The Oxford Handbook of Sound Studies*, 3.

[18] Sterne, 6.

[19] Sterne, 2.

interests within a truly interdisciplinary forum. Psychoacoustics, for example, has implications in playback technology as well as to architectural design and city planning, while the physical competency of hearing has raised questions about perception and the nature of sounds, be it aural, vibrational or contextual. Research dedicated towards assisting the deaf has led to major breakthroughs in sound engineering, while new media theorist Frances Dyson argues that sounds have their own metaphysical presence in her work on sound immersion in the arts.[20] Cultural theorist Steve Goodman takes the physical power of vibration as the basis for an analysis of sonic warfare.[21] In *Reason and Resonance: A History of Modern Aurality*, music anthropologist Veit Erlmann posits that sound has both a materiality and a conditional context.[22] Erlmann traces "aurality" through philosophical thought from the Renaissance to the present in an effort to show that it was pivotal in the formulation of the modern self.

Of course, a major question asked of the field of sound studies is how can one define "sound." Music is a form of sound, but sound studies has taken a broader approach to what constitutes aural phenomena since sound is more than acoustic occurrences. For example, modern culture has introduced a world of machine sounds; the city bustles with the cacophony of activity, while the country is praised for its quiet;

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[20] Frances Dyson, *Sounding New Media: Immersion and Embodiment in the Arts* (Berkeley and Los Angeles: University of California Press, 2009).

[21] Steve Goodman, *Sonic Warfare: Sound, Affect and the Ecology of Fear* (Cambridge, MA: The MIT Press, 2010).

[22] Sterne, 7-8.

acoustic, analog and digital sounds can be radically different or nearly identical due to samplers and synthetic emulators; finally, beyond their ability to replicate, synthesizers can introduce synthetically-produced sounds that are alien to any natural context. Although initially the stuff of science fiction, even these alien sounds have been normalized in a digital age that prominently features them in music, movies and advertising. Sound even goes beyond the ear, as vibration can be felt, even when inaudible. Sound must deal with aurality, in a general sense, but sound must also be understood in terms of resonance and physical vibration.

Sound studies may have begun in earnest with R. Murray Schafer's 1977 publication, *The Tuning of the World,* a work that is also cited as a pioneering example of "Eco-Musicology."[23] A Canadian composer and environmentalist, Schafer's work developed into the field of acoustic ecology, a discipline concerned with studying positive and negative relationships to the sonic environment. In *The Tuning of the World*, Schafer theorized on what he termed, "the soundscape," referring to the immersive sonic experience of environmental sound in everyday life. His intent was to create an awareness of the sonic environment and the negative consequences of disruptive noise pollution, especially for those living in the city. Schafer called for legislative attention to noise, as well as urban planning and sound design to reduce noise irritants.

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[23] Schafer's *The Tuning of the World* (1977) has since been renamed *Our Sonic Environment and the Soundscape: The Tuning of the World* (1993). R. Murray Schafer, *Our Sonic Environment and the Soundscape: The Tuning of the World* (Rochester, VT: Destiny Books, 1994).

Schafer founded the World Soundscape Project at Simon Fraser University in the late 1960s as a response to the declining state of the Vancouver soundscape. The project researched the soundscape of Vancouver by recording and analyzing points of acoustic design and made qualitative distinctions between sounds. A second goal of the World Soundscape Project was to record and preserve national soundscapes in a tour of Canada, which resulted in long, unedited recordings of everyday sound of many specific locations. By the mid-70s, Schafer and his team performed similar preservationist recording and sonic analyses throughout Europe.[24]

The Tuning of the World evolved from Schafer's time in Europe and heading the World Soundscape Project for nearly a decade. The text presented Schafer's research on discerning between beneficial and harmful environmental sound along with theories on acoustic ecology. His attention toward the sonic environment was meant to balance what he perceived as a Western preference for the visual.[25] Schafer advocated for the necessity of a new science of "acoustic design," in which musicians, artists, environmentalists, psychologists and scientists could collaborate on creating harmonious soundscapes.[26] In the opening section, Schafer presents a change from an idyllic, natural soundscape to the

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[24] "The World Soundscape Project," accessed March 9, 2015, www.sfu.ca/~truax/wsp.html. The recording tour of Canada was conducted by members Bruce Davis and Peter Huse.

[25] Schaefer proposes changing visually-based terms like landscape to soundscape to undo the bias toward the visual.

[26] The field would ultimately become known as acoustic ecology.

negative clamor of the industrialized city. He distinguishes between "Hi-Fi," an unfettered, clear and desirable soundscape, and "Lo-Fi," a cacophonous, noisy environment. Schafer's final vision is a sonic utopia in which an enlightened society has reduced noise pollution while appreciating the uplifting sounds and quietness of life. His idea would inspire attention to the sonic dimension of city soundscapes or sonic art that could improve the surrounding space.

Published work in the area of sound studies frequently refer to experimental composer John Cage's famous piece, *4'33"*, particularly when describing the often ignored soundscape of silence. Written in 1952, Cage's most famous work challenges preconceptions about sound, music, ambience, and silence. The score consists of three movements lasting a total of four minutes and thirty-three seconds, during which time, the performer(s) do not play their instruments or any "music" at all. The piece is atmospheric, relying on the surrounding environment to provide the music. Although some may call the piece a period of silence, inevitably, it makes the listener aware that there is never complete silence. It refocuses the attention on the plethora of unnoticed, background sound that is subconsciously washed out.

Cage's *4'33"* remains both controversial and vital. For Cage, it proved that all sounds are music and could be used creatively by anyone to produce music. His earlier work had been busy with percussive noise, but it would be quietness that would endure as Cage's legacy. It was also meant to show that there is no such thing as silence. There is quietness and ambience, but as Cage observed in the Harvard anechoic chamber, the

body's circulatory and nervous systems resonate, making complete silence a human impossibility.[27] There is always sound, and as Cage allowed for all sounds to be music, there is always music.

In its most current iteration, *4'33"* is available as an iPhone App sold for the bargain price of $0.99. The App allows the user to record a "performance" of four minutes and thirty-three seconds anywhere in the world. Users may share their performances for others to listen to and GPS tracking will place your performance on a digital map for others to see exactly where and when it was recorded. A final bonus of the App is a recording of the ambient noises from Cage's New York apartment.[28] The App is indicative of two of the more crucial aspects of contemporary music culture: musical mobility and social media. The portable music player dramatically changed the way we encounter our environmental soundscape, allowing the listener a personalized soundtrack to augment their everyday reality. The contradiction between being out in the world and, at the same time, isolated in a personal sound environment via headphones is

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[27] Hearing Modernity Sawyer Seminar, "Sounds and the Brain," recounts Alvin Lucier's *Music for Solo Performer*, put on in collaboration with Cage, which features electrodes placed on the head in order to amplify the sound of the brain which has a range of eight to twelve hertz. "Sounds and the Brain," Hearing Modernity Sawyer Seminar, March, 11, 2014, http://hearingmodernity.org/events/sounds-and-the-brain/.

[28] "4'33" App for iPhone," accessed March 9, 2015, http://johncage.org/4_33.html.

a point of debate for the modern era.[29] In this context, *4'33"* once again challenges us to tune into the outside environment, precisely what headphones and portable music devices shut out. The second crucial point is the connection to social media, and, specifically, geotracking. GPS location services are one of the most unsettling dimensions of online life, allowing one to access driving directions, reviews of nearby restaurants, or plan your run. However, GPS is also the dystopian nightmare of Big Brother, as we sacrifice privacy for convenience with our technology. By engaging in this short experiment to perform *4'33"* and share with the world, we also give up very specific personal data.

Issues raised by the collision of sound and technology are integral to studying music within a sound studies perspective. A subset of this work dealing specifically with music and the history of technology is Hans-Joachim Braun's *"I Sing The Body Electric": Music and Technology in the Twentieth Century,* which collects essays from different authors exploring the relationship between music and technology.[30] One main theme is that technology changes musical performance from what sounds best on a vinyl record to the guitar amp's feedback. A second major theme is that the difference between an instrument and a machine is largely a matter of opinion or cultural difference. While

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[29] Michael Bull, "iPod Culture: The Toxic Pleasures of Audiotopia," *The Oxford Handbook of Sound Studies*, ed. Trevor Pinch and Karin Bijsterveld, (Oxford: Oxford University Press, 2011), 526-540. Shuhei Hosokawa, "The Walkman Effect," *The Sound Studies Reader*, ed. Jonathan Sterne, (New York: Routledge, 2012), 104-116.

[30] *"I Sing The Body Electric": Music and Technology in the Twentieth Century,* ed. Hans-Joachim Braun (Hofheim: Wolke, 2000).

the synthesizer is commonplace now, authors Pinch and Trocco demonstrate how once it was a strange machine that made noise that excited and bewildered its early users.

Indeed, a goal of this study is to discuss the significant impact that electronics have made in music without solely focusing on avant-garde composers. There is a tendency to overlook the mainstream viability of electronic sounds in order to advance the argument for electronic noise as an aggressive fringe or avant-garde. Rather than look to the more obscure or extreme examples, the focus will instead be on popular artists with widespread audiences. From Jimi Hendrix's highly compressed dive bombs in his version of the "Star Spangled Banner" to Reznor's Big Brother paranoia on concept album *Year Zero* (2007), electronics in music have been used by popular artists to make cultural and political statements about everyday life, especially in times of countercultural upheaval.

The roles of technology in the production of music are numerous. These include the development of instruments as well as the devices used in the capture of sound, namely microphones, amplifiers, headphones, monitors and recording equipment, from magnetic tape to digital audio workstations. An infinite number of analog and digital effects dramatically shape the sound of music, from basic distortion, compression, echo and reverb, to phasers, flangers, wah-wahs, low and high pass filters, oscillators, and ring modulators to name just a few. Once recorded, the audio is mixed into a mono, stereo, or even a 5.1 channel soundscape in which all parts of the music must be adjusted for volume levels, equalization and panned left to right in a virtual soundstage. Mastering

prepares a song for commercial playback by adjusting its equalization and volume dynamics for the transitionary step from recording equipment to mass production. The song then becomes a piece of consumable music in which it is pressed onto a vinyl record, digital CD, or compressed into an audio file via a computerized algorithm. Afterwards, it is duplicated, packaged and distributed to physical or online retail markets via major online vendors like Apple, Amazon and Google, streams through personalized web services such as Spotify and Pandora, or illegally pirated through BitTorrent or other peer-to-peer sharing sources. In the hands of the consumer, the music is played on commercial stereo equipment designed to retranslate the electronic "information" back into the "original sound" of the music to the listener at varying levels of success. At the traditional discursive level of the institution, the technology and "sound" are background concerns, while the close reading of harmony, rhythm, instrumentation and text-music relationships dominate the discussion.

However, production technology provides for music's unique accessibility and easy dissemination, regardless of whether it is popular or art music. Central to this idea is the special relationship between musical technology and freedom of information: amplification seeks to be louder; electronic instruments were first built by amateur radio hobbyists experimenting with leftover parts; and noise is used to deprogram the listener in genres such as industrial music. In 1988, rapper Chuck D famously called hip-hop "Black America's CNN," implying that music has the power to effectively inform and

organize marginalized communities.[31] Most recently, music spurred an internet explosion of file-sharing, remixing, blogging and social networking that helped define the cultural rules of online space and continues to battle over the regulation of cyberspace practices.

Accordingly, this study will also engage with the longstanding tension between man and machine. Electronics in music is about innovation, but also the anxieties of post-industrialization, an internet-fueled communications age, artificial intelligence, and the seeming inevitability of cybernetics in which conceptions of what is human will be questioned. The smartphone is rapidly becoming an extension of the human hand allowing computing tasks to be performed quickly and in a mobile world. In a TV interview about the iPhone, Apple CEO Tim Cook quipped, "we're living 'the Jetsons' with this [iPhone]."[32] The iPhone features complete digital music studio apps where a composition can be recorded and shared from start to finish without ever touching a conventional instrument, a sheet of notation paper, or even a computer. People turn to technology as an indicator and predictor of what the future will be like. Music has played a significant role in that conversation for decades. This study will suggest that electronic music has been a constant revolutionizer of the musical language and a popular touchstone for rapid cultural, technological, and digital advancement.

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[31] Jeff Chang, *Can't Stop Won't Stop: A History of the Hip-Hop Generation* (New York: Picador, 2005), 251. Chang refers to an interview with Chuck D in the February 1988 issue of *Black Radio Exclusive*.

[32] Rock Center, "Apple CEO looks to reimagine television," NBCNews.com video, 6:42-7:14. Dec 6th, 2012. http://www.msnbc.msn.com/id/21134540/vp/50112332#50112332

Jonathan Sterne's *The Audible Past: Cultural Origins of Sound Reproduction* is an important work for the possibilities of interdisciplinary sound studies and the link between sound and technology. He assembles an ambitious cultural history of sound technologies in an effort, again, to balance a Western bias on the visual.[33] Sterne points to the disappointing terms he calls the "audiovisual litany," suggesting aural-based language that differentiates between the senses. In his view, "hearing is a sense that immerses us in the world, while vision removes us from it."[34] Sterne goes beyond recording technology to include medical instruments, communications technology and other examples of sound mediating devices. He problematizes and theorizes sound, while weaving an interconnected history of technological development that is constantly evolving in small steps from various fields—medical, communications, business, and music. It is a contrast to technological histories that herald revolutionary technology as simply appearing as a novel invention or that they augment our natural sense of hearing without totally changing the cultural meaning of hearing.

Sterne devotes considerable effort to a deep analysis of the stethoscope as a tool of sound mediation that allowed the trained listener, in this case a physician, to develop a set of listening skills that required careful attentive focus on the sounds coming from

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33 Jonathan Sterne, *The Audible Past: Origins of Sound Reproduction* (Durham: Duke University Press, 2003). As Sterne posits, "vision is the social chart of modernity," 3. Sterne also criticizes the "audiovisual litany," in which sound is often lumped in with vision. He argues that sound is incorrectly described in visual terms, as it is a different sense and should be independently prioritized.

34 Sterne, 15.

another human being, which he terms an "audile technique."[35] In Sterne's history, this type of interpretive listening became the basis for telegraphy, the extrapolation of which is a constant drive to improve the clarity, fidelity, accuracy, and distance with which to hear each other. Listening through the stethoscope also involved the isolation of the sonic sense and the personal listening through a headset that would become a present day obsession through the portable media player.

Part of the problematic from an American context is the extent to which technological advancement becomes embedded into ideas of democracy, freedom or American Exceptionalism. Electronic music is grounded in the backdrop of the evolving Cold War. As the United States engaged in the space race and kitchen debates, philosophical battles were won and lost via electronic innovation. The intense pressure to push scientific boundaries, coupled with atomic anxiety and a growing mistrust of the government, birthed an undercurrent of Orwellian critique to which electronic music provided the soundtrack. Computerized sounds are now providing the soundtrack for a

35 Sterne defines audile technique as "a set of practices of listening that were articulated to science, reason, and instrumentality and that encouraged the coding and rationalization of what was heard," 23.

new virtual age in which internet privacy, freedom of information and counterterrorist surveillance are negotiating online life.[36]

Furthering this idea will be a consideration of how musicians react to society and predict future trends. Electronic invention challenges the status quo. Noisy elements in music drift in and out of the mainstream, and even the most radical sounds become normalized over time. The loud rebellion of rock n' roll's amplified guitars made parents fear that their teenagers would become juvenile delinquents. As generations evolve, the once raucous rock n' roll becomes golden oldies and parents revolt against the moral depravity of rap music. Special attention will be paid to both cultural and political history to engage noise in music as a socially conscious musical statement, both indicative of new directions or reactionary to the past.

A significant term within this study will be "noise," which Schafer would describe as undesirable sounds within the soundscape. Noise may be defined by its opposition to tonality, harmony, or peacefulness. Machine sounds are often described as noise, an

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[36] Electronic/Hip-Hop artist and political provocateur M.I.A. has recently taken to Tumblr to reblog negative criticisms directed at her "paranoid" 2010 lyrics: "Armbone connects to the handbone/ Handbone connects to the internet/ Connected to the Google/ Connected to the government" and "Headbone connected to the headphones/ Headphones connected to the iPhone/ iPhone connected to the internet/ Connected to the Google/ Connected to the government." It comes as a response to N.S.A. confirming online data collection as a Homeland Security measure and provides a contemporary example of how electronic musicians remain obsessed with power systems, privacy and the control of information. See: Carrie Battan, "M.I.A. Revisits Criticism of /\/\\Y/\'s 'The Message' in Light of NSA Surveillance Revelations," Pitchfork, last modified June 19, 2013, http://pitchfork.com/news/51229-mia-revisits-criticism-of-ys-the-message-in-light-of-nsa-surveillance-revelations/.

abrasive interruption of the natural environment. In terms of fidelity, noise may be signaled by the distortion produced when pushing a playback device beyond its limitations. Noise can also be thought of in terms of sudden disruption or overwhelming volume. Schafer linked noise with power and suggests this relationship causes people to passively accept the noise of warfare, imperialism, and industrialization. In Schafer's definition, it is apparent that noise bears cultural and political significance. Attali espoused a similar view, that noise was the announcement of a challenge to the existing order. Noise holds the key to new modes of thinking, subversive protest or the future order if allowed to gain power. These reasons spur the political motivations to quickly suppress noise as soon as possible.

In *Mechanical Sound: Technology, Culture, and Public Problems of Noise in the Twentieth Century*, sound and technology historian Karin Bijsterveld details a century's worth of noise complaints, industrial, musical or vehicular, across Europe and the United States. She describes how these mechanical sonic environments became a heavy influence in avant-garde modern music. The study shows that there is a long and persistent history of machine noise being met with hostility in modern society. The public debate over noisy environments and the constant attempts at sound regulation or legislation have not solved the problem of our noisy world. In the end, Bijsterveld claims that the unsolvable issue resulted in a "paradox of control," in which legislation was enforced only on some instances of noise, such as air traffic, while others, noisy

neighbors for example, were left to self-policing.[37] The ability to limit unwanted sound correlated to wealth, social position, authority, or politics.

Music historian Paul Hegarty's *Noise/Music: A History,* builds on Attali's ideas of noise. Hegarty proposes that "noise is a negativity," suggesting that noise is defined by society's resistance to it.[38] He argues that "Noise is cultural, and different groups of hearing machines will process sounds differently."[39] If society were to accept the sound, it would no longer be regarded as disruptive noise. Hegarty equates a history of noise with a history of the avant-garde. Therefore, his study centers around artists who do not have a typical commercial audience from John Cage to Japanese noise musician Merzbow. Hegarty also sees room for the continuation of noise analysis in more popular genres, but does not pursue this track in his study.[40] I would extend Hegarty's history of noise into styles of music that are more socially mainstream than his extreme examples.

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[37] Karin Bijsterveld, *Mechanical Sound: Technology, Culture and Public Problems of Noise in the Twentieth Century* (Cambridge, MA: The MIT Press, 2008), 3.

[38] Paul Hegarty, *Noise/Music: A History* (New York: Continuum, 2008), ix. Hegarty asserts that response to noise is not only reactionary, but specifically negative, "Noise then is something we are forced to react to and this reaction, certainly for humans, is a judgement, even if only physical. Noise is not only a judgement on noises, it is a negative reaction, and then, usually, a negative response to a set of sounds," 3.

[39] Hegarty, 3.

[40] Hegarty continues, "Beyond this, there is no reason there could not be more noise analysis of metal or techno," x. I argue that noise is present in most popular genres, especially those typically described as "heavy," "distorted," "dark," "loud" or "electronic," but rarely discussed or analyzed. Hegarty senses the gap in literature considering noise in popular music, but chooses to focus on more experimental and fringe artists within his study.

In his chapter on industrial music, Hegarty sums up the beginnings of the genre and key early bands such as Cabaret Voltaire and Throbbing Gristle. He also produces convincing arguments about industrial music's parodic use of technology and its desire to deprogram the individual from a mass culture existence. However, Hegarty never looks toward Nine Inch Nails, the one industrial band to have major crossover impact in the 1990s despite their noisy and challenging material.

Industrial music's philosophy of deprogramming from a mass culture becomes a significant critique of American life and also a precursor to the anxieties of a digital information age. Thematically, the industrial genre juxtaposes the leftovers of mass production, scraps of metal, magnetic tape, the sounds of a dial-up modem, with the sadistically carnal—excrement, sex and raw meat. Countercultural writer and industrial music historian V.Vale defines industrial as, "the grim side of post–industrial revolution society – the repressed mythology, history, science, technology and psychopathology" in his *RE/Search #6/7: Industrial Culture Handbook*.[41] Vale provides profiles of early industrial bands that defined the beginning of the genre from the embers of the punk

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[41] V.Vale, *RE/Search #6/7: Industrial Culture Handbook*, ed. V.Vale (San Francisco: RE/Search Publications, 2006). Vale's description continues to include a grim worldview dramatically damaged by the Holocaust and post-World War realities, "There is no strict unifying aesthetic, except that all things gross, atrocious, horrific, demented, and unjust are examined with black–humor eyes… The values, standards, and content that remain are of a perversely anarchic nature, grounded in a post–holocaust morality. Swept away are false politeness, etiquette, preoccupation with texture and form," 2.

scene and the underground shock performance and mail art movements.[42] He offers an outline of industrial's main philosophical ideas as organizational autonomy, access to information, the use of synthesizers, and anti-music instruments, the use of extra-musical elements such as film or literary elements, and the use of shock tactics.[43]

Industrial music was mainly a fringe genre that directly commented on the downturn of the industrial economy. It was the sonic equivalent of the rusting machinery that fueled a repetitive, assembly-line work. It critiqued the abandonment of industrial towns for cheaper labor, economic crisis and the vapidity of a culture driven to purchase at all costs. At the same time, using Attali's theory, industrial was prophetically heralding a new world. Its appropriation of mass media imagery pointed to the political power of information control in the coming online culture. Its mail art movement showed the possibilities for subversive direct communication even within spaces of governmental control, such as the postal service. Its heroes were precursors to the cyberpunk hackers of the twenty-first century. Industrial isolated information control as the most powerful political and social tool and sensed the battle over data and privacy before the internet

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[42] Mail art emerged from the Fluxus art movement and refers to the practice of sending small works of art through the postal system. Industrial artists used mail art as a way to subvert a system of mass information delivery. Genesis P-Orridge, founding member of Throbbing Gristle, recounts his early mail art correspondence with San Franciscan Industrial artist Monte Cazazza in an interview for Vale's *RE/Search #6/7*. P-Orridge would send a dead mouse on a plate with a knife and fork, or mutant animals made of resin, rabbit and chicken parts. He exclaims that Cazazza, "nearly got prosecuted by the post office for receiving maggot-ridden, disgusting, stinking parcels," 14.

[43] Vale, 5.

was a mass consumer reality. An industrial band that used the new internet culture to crossover from the margins to mass market appeal, such as Nine Inch Nails, may provide significant insight into how a noisy genre contributed to shaping the transition from a post-industrial fallout to an information technology era.

Bringing an interdisciplinary American Studies perspective, I intend to combine methods of research and analysis from sound studies, musicology, cultural history, media theory, along with digital techniques, to present focused case studies to illustrate how music and technology have contributed to this transition toward online culture. Using Attali's theory, moments of noise will become powerful symbols of change. Since I will mainly be working with music, sound referred to in this study will have musical intent. However, this does not mean that most of the sounds discussed will be traditionally thought of as music, or fall into a transcribable idea of notes on the page. I will specifically be pointing to examples that would be rejected as music in a traditional sense, but exist within mass market, commercial music. These sounds include voltage-generated frequencies, distortion, timbral textures and samples. The aim will be to position these noises as prophetic disruptions while contextualizing their cultural and political power to criticize, historicize and potentially affect social change.

Grounded in Jacques Attali's critical theories about the political economy of music, this dissertation investigates how the subversive noise of electronic sound challenges a controlling order and predicts broad cultural realignment. I examine how electronic music technology introduces new sounds concurrent with generational shifts,

projects imagined utopian and dystopian futures, and engages the tension between automated modern life and emotionally validating musical communities in real and virtual spaces. I argue that the use of electronics in popular music signifies a technologically-obsessed postwar American culture moving rapidly towards an online digital revolution that informs our present online culture. This study extends existing discussions within sound studies to consider the cultural implications of music technology, noise politics, electronic timbre, multitrack audio, digital analytical techniques and online communities built through social media.

In Chapter Two, I trace the emergence of electronic sound in postwar American culture and the invention and utilization of the synthesizer to imagine new sonic possibilities in the 1960s, using the model of sound studies discussed in this chapter. The subsequent three chapters provide case studies of individual popular artists' use of electronic music technology to express societal and political discontent. Chapter Three centers on Jimi Hendrix's application of distortion and stereo effects to narrate an Afrofuturist consciousness in the 1960s. Chapter Four turns to Trent Reznor's aggressive industrial rejection of Conservatism in the 1980s with the band Nine Inch Nails. Lastly, Chapter Five surveys the mediation of online life through computer-based production and performance in the work of contemporary electronic music producer Deadmau5.

Chapter Two will center on the culture of electronic hobbyists repurposing a postwar surplus of parts into experiments with amplification, radio, and new instruments from the theremin to the synthesizer. Inventors Robert Moog and Don Buchla exhibit the

intellectual curiosities of the postwar generation, both having strong academic and commercial ties to the research and development of electronics, physics and circuit production. Moog received an education in electrical engineering and worked in research labs at both Columbia and Cornell, while Buchla pursued a graduate degree in physics and worked in the University of California's Lawrence Berkeley National Laboratory.[44] The synthesizer is a revolutionary instrument that relies on a completely new sound source, electricity, to radically change the possibilities of sound and music. The invention was a mixture between technology and musical intuition. A new silicon transistor featured an output current that was compatible to musical expression, as it had the ability to cross the frequency range of a few octaves. Moog would develop a voltage-control oscillator based on a one vote per octave standard, meaning a change in voltage would change the frequency of a corresponding pitch. Since pitch is based on an exponential relationship in which octaves can be achieved by doubling or halving the frequency, Moog was able to change frequencies of a pitch by turning a knob to increase or decrease supplied voltage. Although grounded in musical principles of tonality, the synthesizer's use of voltage, instead of plucking or hammering, was the source of invention. Moog developed different filters and modulators in order to create various new sounds by shaping the timbral output of the oscillator. The synthesizer became a source of sound that was unlike anything that existed in acoustic-based instrumentation.

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[44] Pinch and Trocco,17-19, 33.

This development should indicate the emergence of a new culture according to Attali's theory.

The synthesizer's development had much to do with industrialization. The instruments were manufactured from spare parts of radio, communication and defense technology. Original synthesizers were large units, often the size of entire rooms, that were held with the reverence of serious, scientific investigation. Access was limited to skilled technicians in elite universities. Bob Moog's hobbyist approach would miniaturize the technology based on small transistors, whereas early synths were vacuum tube driven. Moog imagined the ability to eventually mass produce the instruments in a small-scale factory assembly line with workers soldering the circuit boards and assembling the modules into the final product. It was the beginning of the democratization of the synthesizer.[45] Moog, among other early synth pioneers, effectively repurposed the parts of the industrial-military complex to create a world-changing soundscape that was accessible to musicians and listeners. The appropriation of technology for invention will be a recurring theme in electronic music from the synthesizer to the sampler. Those who are able to hack the machine will be a major focus of this study.

Culturally, the synthesizer was moving far beyond the industrial period. An obsession with space, futurism, and alternate worlds links the exploding genre of science-

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[45] Widespread access to synthesizers is not fully realized until the 1980s influx of consumer-grade keyboard imports built around microprocessors.

fiction to the futuristic sound of the synthesizer. It became the sounds of space, an American obsession in the Cold War era. Since space existed without sound, the bleeps and bloops of the synthesizer gave audiences its sonic reference for the final frontier. The link existed both in fiction, but also in the research labs of universities. Buchla built klystrons for the first particle-accelerators in the high-energy physic laboratory at the University of California. Buchla and Alan Pearlman, founder of ARP, had both engineered equipment for NASA in the 1960s, while Pearlman's ARP synthesizer would go on to produce sound effects for genre-defining movies such as *Star Wars* (1977). The reality and the imagined appear much closer in retrospect, both relying on the soundscape of the synthesizer as a sonic reference.

Science fiction, and its synthesized soundtracks, quickly envisioned a possible dystopian future fueled by postwar suspicion of information control, totalitarian governments and atomic weaponry. Influenced by the anxieties of the atomic age, science fiction frequently disguised political critique within its fantastical setting. Alternate worlds are imagined based on possible choices for consensus society or political dominion; characters are often evolved humanoid or cyborg, as writers question the eventual intersection of humanity and machinery proposed by industrialization. It is attempting the prescient nature that Attali attributes to music by trying to imagine the future. In this context, the synthesizer's upending of music possibilities is indicative of a generational, political and social turn of the baby boomers.

Synthesizers and sound processors remade the recording studio as an electronic laboratory where popular artists began to use the technology surrounding them to realize avant-garde influences from Edgard Varèse to John Cage. The synthesizer made a prominent appearance at psychedelic happenings and found its way into the music of such iconic bands as The Beatles, The Rolling Stones, Pink Floyd, and The Grateful Dead, as well as the live performances of progressive rock band Emerson, Lake and Palmer. Assessing the synthesizer's psychedelic legacy, Pinch and Trocco point out that "We usually think of the counterculture as anti-technology but the new technologies of sound and light, combined with mind-altering drugs, were an integral part of the movement."[46] The synthesizer voiced the most far-out noise of a generation that grew up in an atomic age, looked toward space as the next frontier and united through an introspective journey heavy with psychedelic philosophies. In the 1970s and 1980s, further experimentation with synths, tape loops, splicing, panning, and other mechanical manipulation bore full-scale concept albums. Figures outside conventional race and gender power balances have looked to futuristic sounds and alien tropes to define an alternate world that challenged the status quo.[47]

Chapter Three will focus on intersections of music, technology, futurism, and race. Once electric amplification became commonplace, signal processing via effects allowed for new sonic possibilities. From wah to fuzz distortion, an effects pedal

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[46] Pinch and Trocco, p. 316.

[47] For example, David Bowie's portrayal of the fictional character, Ziggy Stardust.

produces a manipulation of electric current running through a circuit board allowing the musician to change the parameters of the sound instantaneously. I will focus on Jimi Hendrix's relationships with guitar effects producer Roger Mayer, amplification legend Jim Marshall, and engineer Eddie Kramer to argue that Hendrix's use of electronics were just as important in increasing the sonic possibilities of the guitar, as his technical virtuosity and skill. His innovative ideas about creating new sounds were soon realized through the construction of his Electric Lady Studio. Waksman acknowledges the validity of this approach: "Hendrix in the studio was someone else, an almost insular figure who could lose himself in the seemingly endless sound possibilities afforded by electric technology," but does not pursue this line of inquiry.[48]

Waksman, though, clearly points to Hendrix's mastery of the machine by arguing that Hendrix, "specifically and intentionally manipulated his guitar so that it took shape as a technological extension of his body, a "technophallus."[49] But his technologic innovation extended well beyond the guitar to amplification, effects, and ultimately his vision of social justice in a deeply-divided United States. I argue here that his futuristic soundscaping presented a science-fiction themed utopian reality where racial divisions in the United States could be overcome on the basis of psychedelic principles.

Hendrix makes numerous trips into the realm of science-fiction. "Third Stone from the Sun," a jazzy instrumental and sound showcase features intermittent dialogue

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[48] Waksman, 169.

[49] Waksman, 188.

spoken from a spaceship orbiting Earth. His second record, opens with "EXP," consisting of a radio interview about flying saucers followed by an experimental swirl of stereo panning and feedback effects. It is followed immediately by "Up From The Skies," in which his character returns to Earth to see the world has changed and expresses his concern and curiosity about the "new Mother Earth."[50] While these examples are the most literal mentions of space imagery invoked by Hendrix, there are far more sonic exploration of other worlds throughout his catalog. These technologically advanced soundscapes present a version of "Afrofuturism," in which black musicians have used technology, space tropes and imagined mythologies to comment on the alienation experienced in American culture.[51] Hendrix's brand of Afrofuturism would prove inspirational to later generations of African-American musicians, including George Clinton's Parliament Funkadelic and the Atlanta-based hip-hop duo Outkast.

Chapter Four will follow Trent Reznor's unique tract from mainstream outsider to online innovator. His breakout band, Nine Inch Nails, serves as a fascinating case study of industrial music and the targeted use of noise to subvert conformity in a Conservative political era. Electronic music has long-served as the soundtrack for dystopian science fiction, as, for example, Carlos's scores for the films genre *A Clockwork Orange* (1971) and *Tron* (1982). It typically explores themes of control, power, and alienation, the genre

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[50] Jimi Hendrix, *Axis: Bold As Love,* MCA MCAD-11601, 1997, compact disc.

[51] Mark Dery and Ken McLeod, "Space Oddities: Aliens, Futurism and Meaning in Popular Music," *Popular Music* 22, no.3 (2003): 337-355.

lends itself to tales of an apocalyptic future where a totalitarian elite dominates mass forms of communication. While the general populace has devolved to the level of herded cattle, the enlightened few wage a rebellious war against the ministers of information. It is the world of popular entertainment, like the film *The Matrix* (1999), where the hero is a cyberpunk, at once a master of the machine, but still human. These characters serve as prophets, a tie-in to Attali's theory of prophetic music—individuals who are able to create a noise disruption that could shake the rest of society into action.

Reznor has been a musical cyberpunk since the late-1980s. As the visionary behind Nine Inch Nails, his brand of industrial music relies on aggressive digital sounds to promulgate a battle of information between an insider fan community and those in power from record labels to the federal government. These distorted electronic sounds can act with a certain amount of agency when used as noise politics. Nine Inch Nails responded violently toward its historical context, the decline of the Rust Belt, the rampant consumer culture of Reaganomics and Yuppies, and the onset of a communications technology revolution. Reznor understood music in terms of a modern multimedia experience from the start, and he embraced the potential of the computer for music making and building an online community before either was commonplace. Over the past twenty years, he has continued to pioneer in areas of web communication, social media, and new music models from shared multitrack audio to independent music making ventures existing online.

Nine Inch Nails' concept album, *Year Zero* (2007), will serve as a showpiece in the evolution of electronics and popular music. By releasing the album's tracks as Digital Audio Workstation (DAW) files for fans to remix and upload, Reznor opened up the possibility of isolating and analyzing complicated extramusical elements. Multitrack DAW files allow music to be viewed as waveforms and heard as a patchwork of multichannel audio stacked and mixed into a finalized soundscape. Multitrack audio reintroduces timbre to the forefront of musical discussion and may be a part of an exciting new musical model, demonstrating that modern music may be better understood in a multimedia context on the vanguard of technology. The unorthodox release of *Year Zero* exemplifies this study's major themes from the use of electronic and computerized innovation to the dystopian critique of information control in a shift toward cyberspace.

Reznor embraced computer music-making early on and pioneered online fan interaction through remixing and social media. He continues to challenge the industry model through encouraging independent distribution, anti-scalping ticket measures and varied side projects from his Academy Award winning score for *The Social Network* (2010), to his current work on an intelligent music streaming service in partnership with

the Beats headphone brand, which has been recently acquired by Apple.[52] His forward-thinking acumen combined with a cyberpunk independence make Reznor a pivotal figure in an emerging online digital culture.

Chapter Five will examine electronic dance music (EDM)'s surprising takeover of the music industry from 2010 to the present. EDM is a phenomenon of a new generation of children raised in the internet age. They have grown increasingly comfortable and nostalgic about the sounds of digital life. EDM producer/DJs have even begun to build songs around samples taken from internet meme's that trigger feelings of laughter, familiarity, and memories about an online "past" lived merely months earlier. The

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[52] The codename for the project, "Daisy," suggests that Reznor is knowingly participating in a historical dialogue between music and the computer. "Daisy Bell" was the first song "sung" by a computer when it was programmed into an IBM running a speech synthesizer in 1961. It is also the song computer HAL 9000 sings in *2001: A Space Odyssey* (1968). Here, Daisy is the project name for a more artificially intelligent version of Spotify that will react to and suggest music to listeners.

Meanwhile, Beats Electronics,LLC is the audio equipment company co-founded by Dr. Dre and Jimmy Iovine and one of the biggest brands in the music business. Coincidentally, Beats does not sell music--a floundering industry in the current market--but instead sells audio components, mainly headphones, for the mobile, tech-obsessed listener. Beats markets a signature bass-heavy sound which it has married to a Hip-Hop cultural cool via celebrity endorsements. The company has also formed partnerships with computer-manufacturer HP and smartphone producer HTC to build-in Beats Audio's signature sound into their products. Tapping Reznor in the production of a Beats-themed music streaming service appears to be another smart move, given the musician's forward-thinking approach to online music promotion throughout his career. Beats is clearly thinking that the future of the music business relies on providing online access to recordings, selling the components for playback and developing a distinctive sound color that can be marketed as a branded trademark.

Apple Inc. acquired Beats on May 28, 2014 for $3 Billion, linking the two most innovative and important music technology producers of the past decade. Reznor will reportedly remain as COO of Beats Music as the service is absorbed by Apple.

computer, streaming services, social media, and the smartphone have redefined musical distribution while music consumers are soundscaping their daily life through tiny white earbuds. Asking how contemporary musicians, innovators, or inventors have understood their relationship to an industrial and post-industrial world could be a starting point for a discussion of digital identities, online popular entertainment and social networks in the future.

I present the negotiation of online space as a critical element of electronic dance music (EDM) in a case study focused on popular producer Deadmau5. In this case, instead of machinery, youth culture reacts to leftover pieces of digital trash, an overloaded mass of deletions, broken links and an internet cache that can never be completely erased. Collaged together, they respond to dub's ability to endlessly duplicate — copy, paste, delete, remix, refashion, repurpose, repeat. Yet, they seek the communal response of live physical experience in a world that is largely inorganic and digital. Their instruments are not the original, clunky analog synths, but digital models that approximate the originals, or a form of "dubbed" Apps. EDM appears to be fashioning a dystopia of human cybertronics, blurring the line between the digital and the real.

As Pinch and Bijsterveld have noted, "Digital technologies today provide ever-new ways of storing, manipulating, and transferring sound and music."[53] Music spurred an internet explosion of file-sharing, remixing, blogging, and social networking that helped define the cultural rules of online space and continues to battle over the regulation

[53] Pinch and Bijsterveld, 2.

of cyberspace practices. Electronics and music also enter into the long-standing debate over the intersection of humanity, machinery, and aural perception, and may shed insight on the inevitability of cybernetics, in which conceptions of what is human while be questioned. Due to constant miniaturization and wearable and implantable technology, the science-fiction visions of cyber-augmented humanity is not far removed.

Deadmau5 has been on the vanguard of production and performance technology, designing high-budget visual projections, touchscreen control devices and his own signature mau5head, which covers his face during performances. His stage persona is that of the dystopian Mickey Mouse, a sometimes-frightening cybernetic version of the beloved Disney character.[54] Deadmau5 may also have the most inclusive online presence of any major recording artist, frequently making use of social media and replying to tweets from his three million followers. Like Reznor, he maintains fierce control over his brand and online presence, which cements a level of authenticity in an online culture that is often mediated and generic. His website, live.deadmau5.com, features direct access even beyond what Reznor has done with Nine Inch Nails. For a modest yearly subscription fee, fans have complete access to exclusive content, including photos, unreleased music downloadable in high bitrate WAV format, and frequent livestreams and video webchats with Deadmau5, while he creates tracks in his home studio. It is realtime

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[54] Deadmau5 and Disney have entered into a legal battle over the musician's attempt to trademark his mau5head logo. Disney filed an opposition to the trademark in 2014. Deadmau5 has fired back at Disney for using his song in an online promo cartoon, presumably without his permission.

interaction that is unprecedented between a fan audience and a musician at such a high level of commercial popularity.

The online window into Deadmau5's studio shows just how much programming goes into producing EDM tracks. However, live show performances largely center around playback and parameter manipulation rather than conventional performance. The performance amounts to playing tracks that are not much different on any playback device, but showcasing them in a performance space filled with much higher volume and a assembled group of spectators. EDM, although machine-based in production and performance, is ultimately physical for the live audience. The genre has ushered in the return of the large-scale music festival with over a hundred thousand spectators. The show takes on a multimedia approach with futuristic set designs and light shows, which are coupled with a drug culture that seeks superhuman experience through dance and bass-heavy bodily vibration. DJ/Producers assume a dual role where they are both solitary music engineers and rock star shamans.

The idea of the EDM shaman once again begins Attali's cycle of noises. Recently, Harvard's 2013/14 Sawyer Seminar series, *Hearing Modernity*, featured an interdisciplinary exploration of the growing field of sound studies in order to "give ear to the significance of sound in modern society and the cultural and historical contexts in which it resonates most strongly."[55] The seminar concluded with a special talk given by

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[55] "Sawyer Seminar," Hearing Modernity Sawyer Seminar, accessed March 9, 2015, http://hearingmodernity.org/sawyer-seminar/.

Attali reflecting on the prophetic voice of *Noise*, his pivotal text for the field of sound studies. He theorized that in current society, time is the only thing with real value. Therefore, listeners will continue to pay high prices for concerts, while records will be sought for free. The dynamic of the music business has already begun to reflect this trend, especially EDM, which draws the largest crowds to live events, while the artists gain popularity through online services like Spotify, Pandora, and YouTube, where music is streamed for free.

Attali's outlook for the future of music trends includes more people listening to music because of its availability on portable devices. He views the popularity of DJs and remix culture as evidence that property rights will disappear. Attali also points to the big data research being used by companies to predict consumer behavior based on musical tastes. Reflecting on the seminar title *Hearing Modernity*, Attali believes that music will be linked with technology in processes of the body and brain.[56]

Attali's predictions all appear in some form throughout the highlighted case studies. The history of electronic music is a story of music, technology, and modernity. Major themes of futurism, cybernetics and science-fiction fuel a creative commentary on the world of tomorrow. The dystopian tropes of privacy, data-mining, information control and political power are the major issues of the online communications age. Introducing new musical models, or at the least expanding the language, allows for an

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[56] musicdpt, "HearingModernity - 20140421 - 360p24," Soundcloud, April 21, 2014, https://soundcloud.com/musicdpt/hearingmodernity-20140421-360p24.

interdisciplinary approach to today's popular music and its intrinsic link to technological advancement. By paying attention to the noise of artists who manage to move from the margins to the mainstream, and using Attali's theory that these disruptions are predictive of societal trends, we can better understand a culture in transition.

CHAPTER TWO - SWITCHED-ON: THE FAR-OUT NEW NOISE OF THE ELECTRONIC SYNTHESIZER

Synthesizer inventors Bob Moog and Don Buchla exhibit the intellectual curiosities of the postwar generation, both having strong academic and commercial ties to atomic age research and development in electrical engineering and physics. They managed to turn the basement hobbies of their youth into large-scale fabrication of a new instrument, the modular analog synthesizer. In doing so, they both contributed immensely to the world of sound and helped an emerging counterculture find the voice of the future. Historians Pinch and Trocco praise their inventive spirit arguing that, "The reason we have a new instrument in the family of musical instruments is because Bob Moog was a boundary shifter, prepared to let the culture help shape his instrument."[1]

Postwar consumer culture faced a revolutionary challenge from an unsettled social order that rejected mainstream ideology and pushed for alternative lifestyles. As Attali argues, "With music is born power and its opposite: subversion… this [power over noise] is the ability to interpret and control history."[2] According to Attali's theory, a new instrument would be prophetic of a new culture and its noise the sound of social change. The synthesizer voiced the noise of a generation that grew up in an atomic age, looked

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[1] Trevor Pinch and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge, MA: Harvard University Press, 2002), 324.

[2] Jacques Attali, *Noise: The Political Economy of Music*, (Minneapolis: University of Minnesota Press, 2014), 6-7.

toward space as the next frontier and united through a journey heavy with psychedelic philosophies. When asked about the influence of the Haight-Ashbury countercultural scene on her music, synthesist Pauline Oliveros remarked, "Well I don't think that it affected me—I think we affected it," echoing the reciprocal movement between music and culture.[3] Synthesist Jon Weiss reminds us that a Moog synthesizer played in the morning at Woodstock to half a million people, "new sound, new consciousness, new politics."[4]

Sound studies provides a useful tract for critically approaching the introduction of the synthesizer and electronic sound into mainstream culture. The synthesizer is musical, but not traditional. The sound of the machine has perpetually looked forward to the future, rather than forming a rooted connection or nostalgia with the past, as in acoustic folk music for example. Synthesized music is often about timbre, texture, and sonic experimentation, all of which elude translation on the musical score. Producing music with the machine requires the treatment of sound as a fluid, material object that can be shaped, filtered and modulated. Therefore, the synthesizer runs counter to ideas of traditional notated composition or analysis. Since the synthesizer does not operate within conventional acoustic parameters, it invites a different type of engagement. The synthesizer and electronic sound inspire modern methods of music production, which largely rely on computer-based synthesis to create in a multitrack environment, in which

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[3] Pinch and Trocco, 162.

[4] Pinch and Trocco, 4-6. Quote on p. 4.

music becomes bits of manipulatable data. Ultimately, its final legacy was predicting digital technology and advancing the circuit-designs inherent to our modern computerized society.

This chapter traces the introduction of electronic sound and the synthesizer into popular music. I argue that the synthesizer helped transition a technological postwar American culture into the politicized counterculture of the 1960s. I provide a condensed history of electronic sound and technological developments in electronic instruments in order to connect the synthesizer with a twentieth century fascination with physics, electrical engineering, military research and development, and atomic power. The invention of electronic instruments echoed the postwar optimism that daily life could be dramatically improved through technology. Also, I will look to the instances of electronic instrumentation in film, connecting the strange timbres with atomic anxiety, mental illness, and a threat of alien invasion, to demonstrate how unfamiliar timbres of electronic sound produced a discordant noise representative of cultural fear. Lastly, I examine the creation of the analog modular synthesizer and its impact on 1960s' counterculture, which used the new instrument to realize psychedelic sound and inspired cultural icons, such as The Beatles, the Grateful Dead and Jimi Hendrix, to create a new musical language.

At the time of its invention in the mid-1960s, the modular analog synthesizer presented a prophetic sound that informed a social reorganization, the birth of a counterculture, and a technologically innovative musical language. Under Attali's

theoretical framework, the arrival of a new musical technology heralds a shift in the ordering of society. During its prominence in the 1960s and 70s, the synthesizer provided a flowering counterculture with unique timbres and creative self-made noises. A social order developed which appropriated the technological advances of the 1950s for its own cultural expression in the psychedelic music of the 1960s. The new culture gravitated toward both the electric guitar and the synthesizer. Although the electric guitar clearly represented the stage of subversion or rebellion against the norm, the synthesizer was embraced by countercultural musicians for the conceptualization of a new musical language. Pinch and Trocco argue, "The synthesizer is the only innovation that can stand alongside the electric guitar as a great new instrument of the age of electricity" They suggest that, "In the long run the synthesizer may turn out to be the more radical innovation, because, rather than applying electricity to a pre-existing instrument, it uses a genuinely new source of sound—electronics."[5]

The synthesizer marks a fundamental change in an instrument's sound source from acoustic to electronic. It signals a realignment of an electronically innovative culture with noise and introduces new technology to music production. In the postwar atomic age, a curiosity over electrical engineering and physics exponentially advanced the rate of development of electronic sound. The first circuit-based synthesizers were created by inventors who grew up in an era of do-it-yourself electronic hobby kits and surplus military parts. Their invention, the analog synthesizer, was embraced as the

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[5] Pinch and Trocco, 7.

sound of the future in the hands of 1960s countercultural musicians. Electronic music, as an art form, has always been operating beyond the boundaries of time, imagining the sounds of what is to come.

In 1897, patent attorney and inventor Thaddeus Cahill developed the first synthesizer called the telharmonium. The new instrument represented the first leaps in electronic music production and distribution. The massive instrument weighed hundreds of tons and was housed in its own dedicated room in New York City's Telharmonic Hall located at 39th and Broadway. Control wires ran up from the basement instrument room to a keyboard control console from which the operator would perform. Live concerts were sometimes given at Telharmonic Hall, but Cahill envisioned a novel subscription service, in which paying clients could listen to the music via transmissions over existing telephone wires. The music could be pumped into businesses, restaurants or even private homes for a fee. On the other end of the receiver, the client could affix a cone-shaped horn to amplify the sound of the telharmonium's voltage output as the music was carried across the wires like a voice on a telephone call. Enthralled by the new technology, author Mark Twain was the first domestic subscriber of the telharmonium service.[6]

Cahill's telharmonium functioned as a large-scale electric organ where a keyboard triggered a series of tonewheels powered by fifteen-watt electrical generators. Preceding vacuum tube technology for sound generation, the tone wheels instead featured a series of

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[6] Mark Brend, *The Sound of Tomorrow: How Electronic Music was Smuggled into the Mainstream* (New York: Bloomsbury, 2012), 4.

smooth and bumped surfaces that generated a specific frequency when spun at different rates. As frequency correlates to pitch, a collection of tone wheels emitting different frequencies could be used for making pitched music. Later synthesizers will use electricity as a sound source, but the telharmonium relied on an electrically powered mechanical process. Therefore, it is considered an electromechanical instrument, and not entirely electronic.

The telharmonium ultimately failed due to its impracticality. The enormous size and weight meant that the instrument remained localized and could not be brought on tour or performed live outside of Telharmonic Hall. The telharmonium also had a plethora of technical issues including immense power consumption and crosstalk with telephone conversations. Furthermore, it ran into competing smaller and more efficient technology such as vacuum tubes, amplifiers, and broadcast radio, which were superior in quality and cheaper than Cahill's telephone-based subscription service, which dissolved by 1914.

Looking back at the telharmonium, it appears prescient of trends in electronic and digital music's future. The first was that the synthesizer would largely be regarded as a keyboard instrument. The second was Cahill's vision of a music subscription service carried across telephone wires. Communication technology revolutionized the music business as songs have become units of data transferred across the internet, and in the era of dialup modems, literally over telephone lines. The solution to legal music consumption online has veered toward streaming services such as Spotify, iTunes Radio,

and Pandora. These services provide access to streaming music for paid subscriptions or free models based off advertising revenue. Nearly a century before the internet, Cahill had the intuition that music transformed into an electrical current could reach large audiences across the grid.

The tonewheel design of the telharmonium would be miniaturized in the Hammond electric organ, first patented by Laurens Hammond in 1934. Rather than the brushes that ran over the telharmonium's tonewheels, the Hammond uses electromagnetic pickups to translate the disruptions of the electromagnetic field caused by the tonewheels into an output signal, similar to an electric guitar's pickup. The Hammond organ was primarily marketed to churches as a compact and low-cost alternative to large pipe organs. It was the first instance of an electromechanical instrument designed to emulate the sound of an existing acoustic counterpart.

The Hammond organ was frequently paired with the Leslie rotating speaker cabinet for a lush vibrato effect. The signature sound of the Hammond B-3 model, ubiquitous in the Gospel church, and the Leslie cabinet became popular among rock and jazz musicians in the 1960s and 70s, carrying the electric organ's timbre into the context of popular music. The Leslie cabinet also made its way into the touring equipment of many electric guitarists, like Stevie Ray Vaughan and Nils Lofgren, who wanted the phased sound inherent to the doppler effect produced by the internal rotating speakers. In the following chapter, I will discuss how Hendrix used the Leslie and a guitar pedal emulation, the Uni-Vibe, to produce swirling guitar textures.

Both the telharmonium and the Hammond organ were examples of additive synthesis. The output sound begins with the fundamental tone while additional tonewheels add harmonic multiples to thicken the sound. Although both instruments proved influential on the future of electronic music, they were both electromechanical. The beginning of electronically produced sound would come from research and development surrounding radio and vacuum tube oscillators.[7]

Russian physicist, Lev Termen, designed the first popular all electronic instrument in 1920 while performing government-sponsored research into electronic technology. Originally called the etherphone, the theremin took its later name from the Westernized version of Termen, as the inventor began going by the name Leon Theremin on a visit to the United States. When developing vacuum-tube radio sets, he discovered fluctuations in the signal in relation to movements of the body. Theremin realized that the body's capacitance could be used to change pitch, thereby playing the vacuum tubes as an instrument.[8]

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[7] Oscillators convert direct current power into an alternative current signal as a waveform. Early oscillators typically produce curved sine waves, but can also produce square, triangle and sawtooth variations with different tonal qualities. An oscillator's waveforms are audible frequencies, useful for musical application as frequency is analogous to musical pitch.

[8] The theremin depends on the human body's capacitance to shape and pitch the output sound. A straight, vertical antenna controls pitch, while a looped, horizontal antenna controls the output volume. Moving the hand closer to the vertical antenna raises the pitch, while moving one's hand away from the looped antenna increases the volume.

After touring much of Europe with his electronic invention, Theremin came to New York in 1927 for a promotional trip across the United States. Theremin also had a covert secret mission as a Russian spy to gather any information and technical secrets that could prove useful. While in the US, Theremin patented his invention and licensed RCA to produce the Thereminvox, a small run of five-hundred commercially available theremins in the US in 1929. However, the Great Depression effectively ended RCA's commercial venture into novel electronic music instruments and the theremin ceased production before ever catching on with musicians. Leon Theremin remained in the US until he was forced back to the Soviet Union under mysterious circumstances in the late 1930s. He was exiled to a Siberian research and development labor camp under Stalin's regime, but once again gained political favor by using his electronics know-how to invent a small, passive spy bug, which hung undetected in the United States Ambassador's Moscow office for several years. Theremin's dual role as electronic instrument inventor and covert agent sounds strange, but it alludes to the ties between experiments in audio technology and military research and development. The next wave of electronic music would be intrinsically tied to the audio technology of World War II, specifically advances in microphones and tape recorders.

Serious electronic music composition resulted from experimentation with a new recording technology, magnetic tape. Developed and refined in Germany in the late 1920s, magnetic tape consisted of a magnetized powder coating on thin paper, replaced later by plastic film. The recording technology would be kept secret from the rest of the

world until the collapse of Germany in World War II. After the discovery of the new technology, American companies 3M and Ampex began producing magnetic tape and recorders for the commercial market in the late 1940s and ‘50s. It quickly became the standard recording medium, providing higher fidelity and the ability to overdub and physically edit the tape through splicing. The eventual use of multitrack tape heads allowed for recording discrete channels and stereo soundscaping, paving the way for three dimensional sound and digital multitrack audio discussed in following chapters.

Since taped recordings could be spliced and reassembled in a collage or cut-up technique, composers experimented with reconstructing new works based on prerecorded material. This method of composition was termed *musique concrète* by Pierre Schaefer, working in Paris in the late 1940s, to describe his aesthetic method of composing with concrete sounds. *Musique concrète* assembled sound collages built around existing recorded sound. The composing style relied heavily on microphones and magnetic tape recorders to assemble source material for cut-up. In 1951, Schaeffer, composer Pierre Henry and engineer Jacques Poullin established the Groupe de Recherché de Musique Concrète in Paris, providing the artistic base for visiting composers interested in the new technique including Pierre Boulez, Edgard Varèse and Karlheinz Stockhausen. Henry would split from Schaeffer in 1959 over the direction of the artistic movement. Schaefer favored codifying rules of composition and technique for *musique concrète*, while Henry

preferred an open space for invention.[9] Stockhausen also split from Schaeffer over creative differences. He returned to Cologne, Germany and helped establish the foremost electronic music studio in the world. The Cologne-based movement in electronic music differed from *musique concrète* by composing with electronically synthesized signals instead of using prerecorded sounds. The aesthetic movement would come to be known as "Elektronische Musik," and aimed to compose serial music with electronic sound sources.[10]

The use of the atomic bomb in World War II led the United States into the promises and anxieties of a new atomic era. The positivity surrounding atomic power fueled theories of better life through science. One major theory was that abundant electricity would generate from nuclear power plants, a cheap and efficient energy source, without relying on natural resources. The atom sparked an academic surge in physics and electrical engineering, the offshoot being rapid technological advancement in electronic devices. However, there remained a dystopian undercurrent of anxiety in the atomic age, stemming from the horrors of the bomb and nuclear meltdowns at Chernobyl and Three Mile Island. Atomic power represented a modern age of progress, but also the fear of a doomsday scenario reflected in popular culture throughout the Cold War.

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[9] Timothy Taylor, *Strange Sounds: Music, Technology and Culture* (New York: Routledge, 2001), 60-61.

[10] Taylor, 47-50.

Electronic music participated in the cultural debate by sounding the utopian and dystopian visions of the future.

Science and technology were meant to reshape American lives in the postwar era and the tensions of the Cold War split over into this arena. The United States found itself in a metaphorical race with the Soviet Union over nuclear energy and space exploration. The atom and space represented two visions of the future. Whichever political ideology accomplished each milestone first indicated their superiority in global politics. The technological arms race played out on the domestic level in everyday household gadgetry. Richard Nixon and Nikita Khrushchev's kitchen debates brought the Cold War into the average American home, with Nixon arguing that affordable consumer products made life easier and more enjoyable. The masculinized equivalent of domestic technology was the hi-fi system.[11] An obsession over high fidelity audio and radio, amplifier and speaker technology spurred a hobbyist culture revolving around sound technologies. A wartime education in electronics combined with a wealth of surplus parts was the starting point of the inventive curiosity that led to the synthesizer.

Atomic age and science-fiction popular culture combined with hi-fi hobbyist interest to revive early electronic instruments as the sounds of the future. The unfamiliarity of the electronic timbres became an advantage for composers who had to imagine new worlds with no aural context. Mark Brend points out that by the end of the

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[11] For more information on domestic space and high fidelity in the 1950s see: Keir Keightley, "'Turn it down!' She Shrieked: Gender, Domestic Space, and High Fidelity, 1948-1959," *Popular Music* 15, no. 2 (May 1996): 149-177.

1940s, “If your cultural life encompassed light radio, Hollywood movies and the new medium of television, chances are you would have heard electronic sound in music.” These tones came from a range of electronic instruments such as the theremin, novachord, clavioline or solovox.[12] The novachord, an early vacuum tube oscillator-based analog synthesizer produced by Hammond, was used in two of the earliest examples of movie soundtracks to feature electronic instruments, Alfred Hitchcock’s *Rebecca* (1940) and John Huston’s *The Maltese Falcon* (1941).

The theremin’s first prominent use in film came in Miklós Rózsa’s score to Hitchcock’s *Spellbound* (1945) to musically reflect psychological distress and phobia. Hitchcock and his producer where excited by the possibility of this strange instrument and called for it, “to be used in every scene connected with mental disturbance, and also in the title sequence.”[13] Rózsa turned to Samuel Hoffman, one of the only theremin performers listed in the musicians union, to play the unorthodox instrument. Hoffman had a rare level of experience with the theremin, acquiring an early RCA theremin and performing under the alias Hal Hope for many years in New York.[14] Hoffman moved to Los Angeles in the 1940s and gave up performing with the theremin until he was hired by Rózsa for *Spellbound*. The score contrasted themes of love played on acoustic strings with the theremin as representative of dark psychosis. The juxtaposition of acoustic and

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[12] Brend, 21.

[13] Brend, 35.

[14] Brend cites Hal Hope’s Electronic Trio, which featured the theremin, a Hammond electric organ and a fingerboard electric cello, as the first all electronic pop band.

electronic sound proved groundbreaking and Rózsa would go on to win the Academy Award for Best Score for his work on *Spellbound*.[15]

Rózsa and Hoffman collaborated again in the same year on Billy Wilder's *The Lost Weekend* (1945). The film starred Ray Milland in a psychological drama about a writer's desperate and violent battle with alcoholism. Rózsa again turned to the theremin to represent the lead character's mental anguish. *The Lost Weekend* was another critical success, winning the Academy Award for Best Director, Best Picture, Best Actor and Best Screenplay. Rózsa was nominated again for Best Score, ironically losing to himself for his earlier work on *Spellbound*.[16] The successful pairing of Rózsa's compositions and Hoffman's theremin introduced the sound to a large film-watching audience and made 1945 a breakthrough year for electronic instruments in film. Through these films, the theremin developed an association with a troubled internalized psyche. Electronic sound acquired a negative connotation as unnatural or disturbing, qualities that would be exploited in the genre of science-fiction. Soon, the instrument would capture the sounds of space as the public became enraptured by the unidentified flying object.

The UFO craze began in 1947 when pilot Kenneth Arnold reported seeing flying saucer-like spacecrafts. A month later in July of 1947, a sighting of UFOs occurred at the Army Air Force base in Roswell, New Mexico. The public frenzy over flying saucers and aliens resulted in an explosion of science-fiction stories and film in the 1950s, known

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[15] Detailed further in Brend, 31-39.

[16] Ibid.

as a golden era for the genre. Filmmakers and composers had to imagine the sounds of the unknown. They quickly turned to electronic instruments, and their unfamiliar timbres, to construct the sounds of outer space. The two have become so intertwined that electronically generated sound still defines the imagination of space decades later.

Theremin sounds were now in-demand for soundscaping science-fiction films and Hollywood turned once again to Hoffman. He played the instrument on Ferde Grofé's score to early science-fiction film *Rocketship X-M* (1950). The theremin was also used for the movie's sound effects, specifically accompanying the blasting off of the rocket. The following year, Bernard Herrmann would enlist Hoffman's theremin on the score to *The Day the Earth Stood Still* (1951), in which an alien comes to Earth with an ultimatum for peaceful alliance or disintegration, as other planets grow concerned over atomic weapons and intense violence. Hermann built a musical composition with multiple theremins, oscillators and reverse tape effects for a highly electronic-based score which was unlike the previous examples that used the theremin as a singular, strange sound. Hoffman's theremin playing became a staple of the genre, contributing to the scores of *The Thing from Another World* (1951), *Phantom from Space* (1953), *It Came from Outer Space* (1953), *Project Moon Base* (1953), and many more.[17] In these films, the theremin picked up its second context as the sound of outer space. The public began to associate the bizarre electronic noise with futurism, science and technology.

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[17] Ibid.

Hoffman translated his film success into popular music collaborations with composers Harry Revel, Billy May and Les Baxter. Timothy Taylor points to Revel's *Music Out of the Moon* (1947) as a seminal album in defining the space age soundtrack of music, television, and film.[18] Released by Capitol Records in 1947 as part of the popular lounge genre, it featured six pieces composed by Revel with Hoffman playing the theremin. The record's album cover featured a scantily clad woman lying on atop a silver bed sheet that resembled the moon's surface. Hoffman went on to perform on a series of exotic lounge albums including *Perfume Set to Music* (1948) and *Music for Peace of Mind* (1950).[19] Here, the theremin was set in a comforting, background music context. It departs from its film usage to sound out distressful mental illness or threatening extraterrestrial foreigners, normalizing the theremin as desirable exotic background music for the '50s male hi-fi enthusiast.

With the theremin becoming a familiar sound to film, music and television audiences, technologically savvy musicians explored other electronic sources of sound for new sonic possibilities. Louis and Bebe Barron's score for *Forbidden Planet* (1956), the first in the genre to feature human beings leaving Earth on a spaceship to another planet, expanded the repertoire of electronic music and sound effects in film. The Barron's opted to use only electronically generated sounds, in lieu of electric and acoustic instrumentation, to present a soundscape that had never been heard by audiences.

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[18] Taylor, 83.

[19] Ibid.

Inspired by cybernetic theory, the Barron's built custom circuits that functioned as ring modulators.[20] The Barron's worked diligently to record their sonic experiments before the circuits burnt out from being deliberately overloaded.[21] The work of scoring involved a tedious methodology of editing hours worth of recorded sounds, splicing and looping tape and running multiple tape recorders to bounce mixes together as an approach to early multitrack audio recording. The end result was a stunning and imaginative creation of future sounds that pointed toward the next major development in electronic music. In building sound generating circuits, the Barron's were moving toward the core of the analog synthesizer.

The most advanced synthesizer of the time was located at Columbia University. The Columbia-Princeton Electronic Music Center was founded by professors Vladimir Ussachevsky and Otto Leuning from Columbia University and professors Milton Babbitt and Roger Sessions from Princeton University. The Center housed the massive RCA Mark II Sound Synthesizer, nicknamed Victor, which had been built at RCA's Sarnoff Laboratories by Harry Olsen and Herbert Belar and installed at Columbia in 1957.[22] The

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[20] A ring modulator mixes two waveform signals to produce a heterodyne effect where the sum and difference are output as an audio signal with a characteristic detuned, mechanical timbre.

[21] For more information on the Barrons' score for Forbidden Planet see Mark Brend's chapter, "The Privilege of Ignoring Conventions: Exploring the Forbidden Planet," in *The Sound of Tomorrow: How Electronic Music was Smuggled into the Mainstream* (New York: Bloomsbury, 2012), 51-71.

[22] Since it is bolted into the floor and too massive to move, the RCA Mark II still resides in its original location, although it is no longer in use.

advanced, programmable synthesizer was largely designed by Ussachevsky and funded by a grant from the Rockefeller Foundation. The synthesizer relied on an incredible seven-hundred and fifty vacuum tubes to generate sounds. It featured knob controllers that were operated by skilled technicians in white laboratory coats in a scientific atmosphere. The Mark II was programmable through a punched paper input device spun on a reel. The synthesizer worked more like an early computer due to the paper input controls, functioning as an analog/digital hybrid by using inputted binary commands to control analog sound output. Composers were intrigued by the automated ability to work in perfect rhythm at any tempo.

Through the 1950s, synthesizers remained large and drastically expensive due to their reliance on vacuum tubes. It was the development of transistors that allowed for the miniaturization of audio technology, especially apparent in portable radios.[23] In 1947, experiments by physicists John Bardeen and Walter Brittain discovered that passing an input signal through germanium resulted in an output signal with higher volume. The development became a priority for physicist and manager of AT&T's Bell Labs, William Shockley, who saw the potential of semiconductor transistors to replace the cumbersome and power-hungry vacuum tube in telephone and radio applications. Beyond amplification, the transistor provided a second integral function for circuit engineering, acting as an on/off switch. Rather than physically flipping a switch, the transistor can be

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[23] The transistor is a semiconductor device that allows for the amplification of an audio signal.

controlled through voltage to either cutoff or saturate the flow of the current. These on/off capabilities were integral to the development of microprocessors and integrated circuit design that comprise modern computers. When coupled with capacitors that hold and discharge voltage at specific rates, the pair create a controllable sound-producing oscillator. In 1954, the first silicon transistors were produced, which were generally more consistent and stable than germanium. The three physicists were awarded the 1956 Nobel Prize for Physics for their work on the transistor, one of the major electronic breakthroughs of the twentieth century.

The name most associated with the transistor-based synthesizer is Dr. Robert A. Moog, whose circuit design and sound modules virtually define the modern instrument. His brand became synonymous with the synthesizer in the 1960s, and Moog still remains the most important individual figure in the instrument's history. Moog, born in May of 1934, developed a love for electronics growing up middle-class in Queens, New York. His father worked as an engineer for Con Edison and spent much of his free time as an amateur radio hobbyist. As a child, Moog worked on hobby kits and do-it-yourself electronics projects in his father's basement workshop. Self-described as a shy child, he exhibited a particular talent in the sciences, which gained him an exclusive placement at New York's Bronx High School of Science. A bright student, Moog continued his education, earning a degree in physics at Queens College and electrical engineering at Columbia University. At Columbia, Moog learned how to design and build circuit boards, which would prove to be an integral part of his synthesizer. Ironically, he never

stumbled across the Columbia-Princeton Electronic Music Center or its RCA Mark II, even though Moog's life work would reshape electronic music and sound synthesis.

The postwar abundance of cheap, military surplus parts gave Moog lots of available material for his basement experiments. Oscillators were a popular purchase for the musically-inclined and Moog, a piano player since childhood, became interested in building his own electronic musical instruments. Hoffman's film work had reintroduced American audiences to the sound of the theremin, but there were no commercial producers of the instrument since RCA's limited run in the late 1920s. However, the theremin was a fairly easy electronics build and detailed instructions were provided in hobby magazines as early as the 1930s.[24] Moog built his first theremin in 1949 and became enamored with the instrument for the rest of his life.

At nineteen, he started his first company, R.A. Moog Co., with his father out of their basement workshop, selling both assembled and hobby kit theremins. Moog continued to sell theremins while he pursued an engineering physics Ph.D. from Cornell University. During his studies, Moog set up a modest operation in upstate New York's Trumansburg in 1963, producing theremins and budget guitar amplifiers. The amplifier business proved disastrous, as Moog struggled to meet orders and cheap parts malfunctioned initiating frequent customer returns. Moog soon turned his attention toward inventing a wholly unique instrument, the analog modular synthesizer.

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[24] Brend, 30.

An interaction with composer Herbert Deutsch at a conference in Rochester began a working partnership on designing electronic instruments for a studio setting. Deutsch invited Moog to an electronic music concert, which was Moog's first real encounter with the growing avant-garde of electronic music. As Moog recalls, "It was absolutely the most exciting musical performance I had ever seen… it was immediately after that concert that we talked about a synthesizer… a sort of portable electronic music studio."[25] Moog designed circuits around silicon transistors and collaborated with Deutsch to try to get these modules to create musical sounds. By mid-1964, Moog had developed his first modular synthesizer prototype.

Moog's key insight into making music with a synthesizer was the idea of voltage control. He developed a one-volt input to one-octave output standard ratio in order to produce a musically translatable electronic circuit. By controlling changes in voltage, the synthesizer player could alter the parameters of the output sound. Moog was able to sweep through the pitch range of an oscillator by increasing or decreasing a control voltage at the input stage. Moog used two oscillators in his original prototype, allowing the output voltage from the first to control the pitch of the second according to Moog's one-to-one ratio, which resulted in musically predictable sounds.

Moog's oscillators were capable of producing four types of waveforms: the brassy sawtooth, the whistling sine, the flute-like triangle and the nasal-toned pulse

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[25] Pinch and Trocco, 22-23.

waves.[26] These waveforms are the basic signals of synthesized sound. The oscillators presented one significant problem, they were sensitive to temperature and easily drifted out of tune as the machine heated up during use. The operator would have to occasionally stop and retune the device, presenting the biggest obstacle in using a Moog for live performance. The original systems were conceived as studio instruments, while Moog and his competitors worked to produce more stable oscillators that musicians could rely on when on the road.

Moog's envelope generator was one of the first sound manipulating modules on the synthesizer. The envelope referenced an acoustic instrument's properties of attack and decay. An instrument's attack time refers to the initial acceleration of the sound to its peak volume. The decay represents the natural fading of a sound over time. A spectral analysis of different instruments reveals their unique properties in producing sound and subsequently trailing off. Without an envelope, the synthesized sound would remain constant, only switching on and off depending on supplied power. By applying an envelope generator to the oscillator, the operator can craft unique sounds or mimic the attack and decay of existing instruments. Most envelope generators allow the manipulation of the waveform through four properties: attack, decay, sustain and release. Sustain refers to the level held after the attack, while release sets the duration of the sound's peak to the decay.

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[26] Pinch and Trocco, 28.

Moog's synthesizer is an example of subtractive synthesis, in which all sound frequencies are present and must be sculpted and attenuated through filter modules. The telharmonium and Hammond organs were examples of additive synthesis, in which harmonic tones are added to a base frequency. Moog's filter stage had to be designed to allow specified frequencies to pass through, while attenuating others. Thus, a low-pass filter allows frequencies below the set cutoff frequency to pass through, while subtracting high frequencies from the output. A high-pass filter works in the same way for frequencies above the set cutoff. The two can be used in conjunction to form a bandpass filter, which accentuates the midrange frequency while rolling off both the highs and lows. Moog achieved one of most sought after sound processing effects by crafting a unique low-pass filter that fattened the bass tones of his synthesizer.

Moog's ladder filter became the signature of his sound. It was Moog's first truly original filter based around a stacked ladder of transistors that worked in conjunction as a low-pass filter. Musicians could use this filter as a gate, adjusting the harmonic frequency cutoff to shape the timbre of the output sound.[27] When overdriven, the ladder filter produced a thick, analog distortion that was a coveted part of the Moog sound and defined electronic bass for decades. The ladder filter seemed so important and integral to

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[27] By opening up the filter gate, more high pitched harmonic frequencies are allowed to pass. Lowering the gate cuts off the higher frequencies allowing only the low end of the harmonic spectrum through. Moog's circuit enabled control over the attenuation of high frequencies via a controllable cutoff slope.

the Moog sound that it became the only piece of the synthesizer that Moog patented up to that point.[28]

Moog designed these individual circuits to function as a modular synthesizer, meaning the entire synthesizer was comprised of separate pieces that could be configured according to a customer's unique needs and preferences. Moog used identical quarter-inch mono patch cables to control voltage, audio signal and output across the entire system. Any unit could therefore function as a control for the others, providing the flexibility for experimentation and unexpected sonic discoveries. The modular design allowed components to be switched out or expanded as needed.[29]

The last decision facing Moog was whether to attach a controller and what kind would best suit his instrument. The synthesizer could be operated through patch cords and knob twisting, but this type of operation would be unfamiliar to most conventional musicians. The keyboard controller is a point of contention in the early design and theoretical practice of synthesizers. The synthesizer, as a novel instrument, was a space for creative invention. By attaching a keyboard, the synthesizer would be inevitably linked to a lineage of piano music and Western classical traditions. Recalling Attali's theory, the addition of the keyboard could cause a revolutionary source of new noise to fall into a cycle of repeating old tropes. These associations could stifle the imaginative

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[28] Pinch and Trocco, 65.

[29] Although all-in-one units would become popular budget choices in the future, the modular design remains popular for analog enthusiasts who desire the versatility of assembling a custom synthesizer.

capability of electronic music and sound sources moving forward, as Vladimir Ussachevsky feared. At the urging of Herb Deutsch, Moog, attached a keyboard to his modular synthesizer.[30] Instead of the mechanical process of a key triggering a hammer, as in a traditional piano, each key on the controller delivered a set voltage to the synthesizer. Since the sounds were voltage-controlled to Moog's one-to-one ratio, a specific amount of supplied voltage produced a definable pitch within the frequency range. The keyboard certainly helped Moog sell his product to musicians who were more comfortable with the familiar keyboard than the array of knobs, switches and cables. However, its inclusion did define the legacy of the synthesizer as mainly a keyboard instrument, which detracted from its uniqueness and maybe even determined that the synthesizer would become an instrument used primarily for emulation in the future.

The Moog analog synthesizer made its commercial debut at the 1964 Audio Engineering Society (AES) convention where Moog presented a paper on voltage-controlled electronic music and demonstrated his prototypes. Here, he received his first order of a synthesizer from composer and choreographer Alwin Nikolais. Early Moog synthesizers where cost-prohibitive and too complicated to be commercially successful. The few original models that sold went largely to academic electronic music labs, as evidenced by his second customer, the composer Lejaren Hillar at the University of Illinois. The Moog synthesizer arrived as a series of modules and patch cables with no instruction manual or explanation on how to use the equipment or produce sound. Since

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[30] Pinch and Trocco, 59-60.

analog subtractive synthesis was unfamiliar to most users, Moog often had to send a technician along to demonstrate how to use the equipment to new customers. A later solution involved short training camp sessions at the Moog factory in Trumansburg as a part of the purchase package. In these sessions, customers would learn the basics of subtractive synthesis and receive guidance on creating basic patches. Without these personal demonstrations, it would be rather perplexing to coax any sound from the modules.

Moog's third customer was the experimental advertising composer Eric Siday. Siday already had a successful career composing electronic jingles and sound signatures for television advertising and was one of the few musicians that could afford to purchase a personal Moog synthesizer. Siday originally relied on oscillators and tape splicing to craft his unique electronic signatures, but saw tremendous potential in Moog's new instrument. Moog built and delivered a custom synthesizer to Siday consisting of his modules encased in a wooden cabinet and a keyboard controller.[31]

Moog did not call his invention a synthesizer until 1966 and used the term to refer to the modular construction of his complete instrument, in other words to make a whole out of parts, rather than referring to a synthesized sound. The name synthesizer had already been used in the RCA Mark II Synthesizer. Still, there was an undesirable resonance between the word synthesizer and synthetic, a growing concern as the

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[31] A popular example of Siday's electronic sound effects in commercial advertising was the popping sound of the Maxwell House Percolator.

instrument drifted toward emulating other instruments. In this early phase, Moog and the handful of synthesizer operators did not quite know what this instrument was capable of or could become. Moog smartly turned to his relationships with musicians and their input to improve his machine. Moog's friendship with Wendy Carlos was one such relationship that helped shape the evolution of the synthesizer.

Carlos, born Walter Carlos, studied classical piano as a child and began experimenting with electronic music and tape splicing by her late teens. Exhibiting a natural aptitude for science, Carlos went on to study physics and music at Brown University. She later received a master's degree in composition under Ussachevsky at the Columbia-Princeton Music Lab. After Columbia, Carlos took a job at Gotham Recording Studios and furthered her expertise engineering recordings. Carlos met Moog at the 1963 AES convention, and from there, began testing prototypes and modules while providing useful feedback on the designs. Carlos became one of Moog's early independent customers, acquiring a full Moog modular sound system in 1966.

Carlos suggested features that would improve the performance and versatility of the synthesizer and Moog would adjust his designs to Carlos's specific requests, including the addition of portamento control, various filter modules and a touch-sensitive keyboard controller that responded more to the player's nuances. Over the next couple of years, Moog would travel from Trumansburg to New York City, bringing new modules and prototypes for Carlos to beta test. The culmination was Moog's first official product line, the Moog 900 Series Electronic Music Systems. Carlos produced a demonstration

record with sound samples and an introduction to the technical details of the Moog system as a companion piece. The record, distributed by the R.A. Moog Company, was Carlos's first commercial release and also the first time that many people heard the sounds of the Moog.

Carlos and the Moog's mainstream breakthrough came on her next record, 1968's *Switched-On Bach*. Every nuanced timbre had to be created through a series of trial and error patch configurations. Once Carlos arrived at a desired sound, the phrase was quickly recorded before the oscillators drifted out of tune. Further complicating matters, the Moog synthesizer was a monophonic instrument, meaning it was only capable of playing a note at a time. Carlos would have to record all polyphonic parts as individual lines, overdubbing them together on a custom eight-track tape recorder. The process of recording proved laborious as Carlos had to continuously change patches, adjust the tuning of the synthesizer and record a multitude of small phrases that would have to be cohesively pieced together. The concept and execution could only be realized in a recording studio and the complex nature of its construction meant that this music was tied to the physical media and not intended for live performance.

Until this point, the synthesizer had been a tool for exploration by avant-garde composers and experimental academic music studios. Carlos's reinterpretations of Bach demonstrated a level of control in which she was able to harness the capabilities of the machine in the production of traditional music. She put the new technology into musical practice and sparked a large-scale buzz about a fresh noise and its implications on the

future of electronic music. The album was a surprising commercial hit and critical success. It won three Grammy awards for Best Classical Album, Instrumental Soloist Classical Performance and Engineered Classical Recording.

Even as a bonafide hit record and the mainstream introduction of the Moog synthesizer, the album had its detractors. Criticism largely centered around Carlos playing traditional classical music on a keyboard instrument. Although the novel timbres amazed the casual listener, practitioners of electronic music lamented the lack of experimentation and invention to create a new form of music with the instrument. The criticism amounted to trepidation that the synthesizer and the synthetic would be forever linked. Carlos popularized the sound, but possibly lost the subversive power of chaos, noise and uncertainty inherent to the analog machine. Carlos's choice to use Bach compositions reaffirmed Ussachevsky's argument that attaching a keyboard would dictate the style of music produced by the instrument. In terms of Attali's theory, the commercial turn normalized the sounds by setting the synthesizer in the context of familiar, traditional music. Thus, it traded its subversive political economy as a new instrument for a level of commercial exposure and acceptance. A wave of copycat albums followed, attempting to cash in on the Moog craze, including *The Moog Strikes Bach* (1969), *Switched-On Bacharach* (1969), *Music to Moog By* (1969) *Moog Power* (1969) and even the holiday-themed, *Switched-On Santa* (1970).[32]

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[32] Brend, 199.

Switched-On Bach also brought the public's imagination toward the machine, more so than the musician. Describing the powerful presence of the Moog synthesizer on the album cover, Brend argues that, "The recording artist is rendered almost irrelevant and the Moog itself is the star, reinforcing, perhaps unintentionally, the prejudice that electronic music is inhuman, that the machines really were taking over."[33] The relationship between man and machine is a fundamental tension of technological advancement and the Moog's powerful presence invoked a fear that music would become mechanical and repetitive, losing its human element at the cost of employment and security for a generation of musicians who may be replaced by the synthesizer.

As the album grew in popularity, Carlos began a gender transformation, living and dressing as a woman and undergoing hormone treatments in 1968. The success of *Switched-On Bach* unexpectedly put the very private Carlos into the public spotlight at a time of intense transition. Feeling pressure to perform as a man at concerts and TV appearances, She withdrew from public life and stopped making appearances. Carlos underwent gender reassignment surgery in 1972 and revealed her new identity in a 1979 interview for *Playboy*.[34] Although removed from the public eye, Carlos continued to record, producing two followups to *Switched-On Bach*, *The Well-Tempered Synthesizer* (1969) and *Switched-On Bach II* (1973). She also moved into film scoring, working on Stanley Kubrick's *A Clockwork Orange* (1972).

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[33] Brend, 197.

[34] Arthur Bell, "Playboy Interview: Wendy/Walter Carlos," *Playboy,* May 1979.

Carlos's versions of Bach constituted something different, even if they were not as radical as the avant-garde electronic music community wished. *Switched-On Bach* was a familiar work set in a radically different and modern language. The origins of the electronic sound source introduced fundamentally new timbres to popular music. It shifted electronic sound from a spooky or futuristic novelty to critically and commercially accepted music. As Carlos recalls, "When we started *SO-B* my goal was to demonstrate that I could make 'real' music with Bob Moog's marvelous new synthesizer. Then I could 'get on' creating my own music with it."[35] *Switched-On Bach* proved that the synthesizer had a context in creating serious music, electronic, academic or popular. The sound paralleled Wendy (formerly Walter) Carlos's extreme gender reassignment measures. As Pinch and Trocco point out, "The liminal status of the synthesizer is most apparent when its operators themselves crossed boundaries and transgressed social words… as Walter/Wendy Carlos."[36] Personally and musically, Carlos illustrated the ability to re-contextualize, as well as ultimately re-identify oneself. Within these sentiments lies the importance of the synthesizer to the emergence of the 1960s counterculture.

Electronic instruments played a large role in music's psychedelic turn. Beach Boy Brian Wilson turned to the unusual timbre of the theremin as the band's music

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[35] Wendy Carlos, "Remember when…?," Wendy Carlos S-OB, accessed March 9, 2015, http://www.wendycarlos.com/+sob.html.

[36] Pinch and Trocco, 315.

transitioned from surf pop to ornate teenage symphonies. Wilson brought in Paul Tanner to play an electro-theremin on *Pet Sounds* (1966), and then again to provide the signature electric sweep to followup single, "Good Vibrations." The sound was catchy and instantly became one of rock music's most memorable moments. However, it was not actually a theremin on the record, but an emulation device Tanner had developed and named the tannerin.[37] The tannerin imitated the theremin's tone, but used an oscillator controlled by a sliding mechanism for more precise pitching. The theremin's complicated hand movements required a trained performer, and even still, guaranteeing the line could be reproduced at the right pitch every night on tour was nearly impossible. The Beach Boys sought an alternative to using the impractical theremin for live performance and turned to Moog. His solution involved a ribbon controller to control the output of the oscillators. The strip of metal relied on the fingers capacitance to change the pitch, sliding up for higher pitches and down for lower tones. The innovative controller was an alternative to the keyboard control and provided a sliding output more akin to a stringed instrument. It also allowed the performer to add expressive vibrato to their playing. The final step was adding marks to the wooden casing to indicate pitches, much like a guitar's fretboard. Moog's ribbon controlled electro-theremin allowed the Beach Boys to consistently recreate the signature electronic sound of their hit and brought the sound of an oscillator into the world of mainstream pop music.

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[37] Brend, 131-134.

To fully integrate the sound of the Moog into the counterculture, Moog would have to introduce his modular system to the emerging music scene on the West Coast, bringing his synthesizer to Los Angeles for the 1967 Audio Engineering Society convention. He was met by synthesist Paul Beaver, who desperately wanted to become Moog's West Coast sales representative. Already doing session work with the synthesizer alongside musical partner Bernie Krause, Beaver saw an untapped market among his contacts in the industry.

Beaver and Krause spent countless hours learning the complicated Moog and programming patches. Opportunity arose for the pair of synthesists when Elektra's president, Jac Holzman, decided to transition the record label from folk music to new electronic music, sensing the shifting attitude and aesthetic interests of the younger generation. He arranged for Mort Garson to arrange music based on the Zodiac with synthesists Beaver and Krause operating the new technology. The collaboration resulted in *The Zodiac: Cosmic Sounds* (1967), one of the first commercial records to prominently feature the Moog synthesizer. While a moderately successful cash-in on psychedelic culture, the record established a link between the synthesizer and the counterculture, sounding, "the beginnings of an association between electronic music and the exotic mystical, hallucinogenic aspects of hippy culture."[38] The far-out sounds of the synthesizer took on the amorphous cosmic energy of the acid trip.

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[38] Brend, 162.

The breakthrough moment for psychedelic rock, and the genre's interest in the Moog synthesizer, occurred during the Summer of Love's musical highpoint, the Monterey Pop Festival in 1967. Beaver and Krause set up their Moog modular system for demonstrations at the Monterey Moog stall and began taking orders from the now famous and wealthy countercultural musicians performing at the showcase festival. Flush with new record deals and recording advances, rock musicians could indulge in the new, expensive technology. Only a few Moog synthesizers were in existence before the show, but Beaver and Krause took nearly a dozen orders for the $15, 000 system by the end.

Moog, who constantly struggled to make payroll and keep his factory operating, saw a lucrative market in the counterculture and acid rock music. He opted to turn over West Coast promotion, sales and operations to Beaver. The Moog quickly took off among a generation of rock stars that were looking to push their music into more experimental territory. Early purchases were made by Mike Dolenz of The Monkees and Roger McGuinn of The Byrds. The biggest bands of the British invasion also took an interest as Brian Jones of The Rolling Stones and George Harrison of The Beatles acquired their own Moog synthesizers. Soon after, The Doors, Frank Zappa and Stevie Wonder all began experimenting with the new technology. Even Motown Records purchased a Moog. Despite its growing popularity, there was still general confusion over what the synthesizer was capable of and exactly who would be interested in using the machine. As Pinch and Trocco point out, "When the modular Moog synthesizer was first

used in recording studios, no-one knew what to call its operators: were they engineers, programmers, producers, musicians, or what?"[39] Beaver and Krause worked furiously selling the Moog, teaching the theory of subtractive synthesis to their new clients, taking part in recording sessions and doing side work for film scores and sound effects.

By the end of the 1960s, the Moog synthesizer increasingly appeared on hit popular records, adding dynamic layers and textures to pop music. The Doors' album *Strange Days* (1967) marked the first significant appearance of the Moog in recorded rock music. Doors' frontman Jim Morrison processed his vocals through the Moog's envelope filters to achieve a warbled, otherworldly tone on the leadoff and title track, "Strange Days." The opening song introduced the Moog's trippy modulations to the West Coast counterculture. Also in 1967, Micky Dolenz and Paul Beaver played the Moog on "Daily Nightly" and "Star Collector" from The Monkees' foray into psychedelic pop music, *Pisces, Aquarius, Capricorn & Jones Ltd.*. Followed by Beaver's work on *The Zodiac: Cosmic Sounds*, the sound of the synthesizer became a auditory reference for astrological mysticism.

The Rolling Stones' psychedelic rock album, *Their Satanic Majesties Request* (1967), seemed an answer to The Beatles release of *Sgt. Pepper's Lonely Hearts Club Band* (1967). The album was recorded under a haze of heavy drug use and produced by the band members after a split from producer and manager Andrew Loog Oldham. Although the album would be criticized for its lack of focus, it did, however, present the

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[39] Pinch and Trocco, 314.

Stones at a very experimental phase. Part of the new instrumentation featured on the album was Brian Jones' recently acquired Moog synthesizer. Mick Jagger took a particular interest in the Moog and Jon Weiss flew from the Moog factory to London to give the rock star lessons in synthesis and operation. The Moog became a musical prop in the British crime-drama film *Performance* (1970), in which Jagger starred as a former rock star playing the Moog through the freak out experimentations of drugs, sex and music going on around him.[40]

The Moog synthesizer also became part of the evolution of folk rock bands, The Byrds and Simon and Garfunkel. Already making the turn in psychedelic rock with the single "Eight Miles High," 1968's *The Notorious Byrd Brothers* reflected The Byrds, under Roger McGuinn, at their most experimental fusion of rock, folk, electronic and jazz. Part of their new sound relied on McGuinn's recently acquired Moog. Beaver ultimately played most of the synthesizer during recording sessions, except for "Space Odyssey," which features McGuinn operating the synthesizer. The futuristic track features The Byrds' harmonized vocals detailing the discovery of a pyramid on the moon over a droning soundscape of electronic noise. The folk rock duo Simon and Garfunkel utilized the electronic noise of the Moog on "Save the Life of My Child," the second

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[40] Pinch and Trocco detail the cameo appearance of the Moog in *Performance* (1970) on pages 302-305. Citing the film as the only appearance of the Moog in a movie.

track on *Bookends* (1968).[41] After a brief acoustic guitar introduction, the concept record about a human life cycle begins with a jarring stab of thick, analog bass produced by the Moog. The characteristic sound returns throughout the track, while other background sweeps are produced with the synthesizer. The synthesizer's bass presence is particularly powerful and will ultimately become one of the Moog brand's prized attributes. *Switched-On Bach* had been released between the two records and audiences began to realize that the strange sounds appearing on pop records were being produced by the mysterious Moog synthesizer.

The Moog was soon featured by of the world's biggest rock band, The Beatles, after guitarist George Harrison purchased a Moog from Paul Beaver. Harrison and producer George Martin both learned the basics of synthesis through private sessions with Beaver and Krause. Harrison became so enamored with the new technology that he released a solo album of synthesized electronic music, *Electronic Sound* (1969). The record featured two lengthy tracks, "Under the Mersey Wall" and "No Time of Space," comprised of Moog synthesizer with some overdubbing and tape delay effects. The album cover featured an original painting by Harrison of a smiling cartoon figure in front of cartoon representations of a patched synthesizer modules feeding sounds into a machine emitting colors from a tube. The second side largely featured recordings taken from Krause's demonstration of the synthesizer to Harrison. Since this material was

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[41] Timeline of Moog appearances on popular recordings taken from "Sonic History of Moog Instruments: Early recordings," Bob Moog Foundation, accessed March 9, 2015, http://moogfoundation.org/sonic-history-of-moog-instruments-early-recordings/.

recorded and released without Krause's knowledge or consent, a rift between the two musicians eventually led to legal action by Krause. *Electronic Sound* was a commercial flop, but the Moog would go on to play a significant role in The Beatles next album, *Abbey Road* (1969).

Harrison, Paul McCartney and John Lennon all used the synthesizer with dramatically different effects on multiple songs throughout *Abbey Road*. Lennon coaxed washes of building white noise in the unsettling final minutes of "I Want You (She's So Heavy)," until the static overtakes the mix and abruptly cuts off. McCartney uses the Moog as a solo instrument on "Maxwell's Silver Hammer," featuring the unique sliding voice of the ribbon controller for his second solo. Harrison's application of the Moog on "Here Comes the Sun" lends a lush, warming quality to one of The Beatles' most beloved songs. The Moog reappears on the next track, "Because," as Harrison adds two short solos during the bridge and the ending. With prominent spots on records by some of the biggest names in rock music, Moog's brand quickly became synonymous with the synthesizer, however, it was not the only analog synthesizer to have an impact on the 60s counterculture.

Around the same time that Moog was developing his synthesizer in Trumansburg, Don Buchla was prototyping a synthesizer on the West Coast. Buchla, like Moog, exhibited an interest in electronics from childhood and started by building crystal radio sets. Buchla received a degree in physics from the University of California Berkeley in 1959. He began pursuing a graduate degree while building klystrons, which produce

electric fields in a particle accelerator, for the University of California's Lawrence Berkeley National Laboratory. Buchla soon found himself working on various NASA projects at Berkeley as the space race became an increasingly important part of the Cold War.

Buchla joined the Free Speech protests at Berkeley in response to pressure from the House Un-American Activities Committee to keep the government projects at Berkeley quiet. Led by Mario Savio, the Free Speech Movement began in the fall of 1964 when the University of California Berkeley banned political demonstrations and awareness tables on campus. The protest was organized as a sit-in that eventually took over the administration building, Sproul Hall. Buchla eventually dropped out of the political turmoil and left the University. He turned his attention toward outside projects in specialized audio technology and electronic music. He quickly developed a speciality in using transistors to build small electronic devices, including amplifiers and electronic aids for the deaf and blind. The development of transistor technology steered Buchla toward designing circuit-based electronic instruments and he founded his manufacturing company, Buchla and Associates, in 1962.

Buchla's growing fascination with tape splicing and electronic music led him to the San Francisco Tape Music Center. The Tape Music Center, founded in 1962 by Morton Subotnick and Ramon Sender, housed a collection of experimental electronic equipment owned and created by like-minded composers in a collaborative space. Musicians gathered together to share aesthetic ideas and technical know-how for

advancing the art of tape music. The Tape Center would also put on occasional happenings of avant-garde electronic multimedia concerts. Composers of electronic music, including John Cage, Terry Reily, Steve Reich, Pauline Oliveros and Karlheinz Stockhausen premiered pieces, gave talks and mingled.[42]

Buchla used his electronic skill set to build a ring modulator for the Tape Center and began discussing other instrument design possibilities with Sender and Subotnick. Tape splicing was an involved and complicated process and performances, which generally consisted of playing back the edited tape, were not visually interesting or inspiring. Sender and Subotnick began looking for new methods to address both concerns and ultimately dreamed of a small, electronic box that musicians could use to produce music at home and perform with in a live context. A grant from the Rockefeller Foundation allowed the Tape Center to fund Buchla's design experiments and he was commissioned to create a new electronic instrument for the Tape Center that would bypass the intensive tape splicing methods of electronic music.

In a moment of coincidental simultaneous invention, Buchla began exploring voltage control at roughly the same time as Robert Moog in New York. Both Moog and Buchla build their first prototype synthesizers in 1964 with no knowledge of the other's invention. Buchla built transistor-based oscillators that could be swept through voltage control. He also thought in terms of a modular design, allowing for pieces to be

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[42] For more on The San Francisco Tape Music Center see *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, ed. David Bernstein, (Berkeley and Los Angeles: University of California Press, 2008).

reconfigured and swapped as invention and experimentation dictated. One major difference existed between the two designs, Buchla was against the keyboard controller from the start and opted instead for touch-sensitive finger pads as a control surface. Buchla asserts that the lack of a keyboard engages the operator in a different way, "A keyboard is dictatorial… when there's not a black and white keyboard you get into the knobs and wires and the interconnections and the timbres."[43] The keyboard represented an established way of making music, but for Buchla, the synthesizer should come from an entirely new direction. Buchla's metal plate controllers relied on pressure and conduction of electricity through the fingertips. Variations in the amount of skin on the contact or the pressure with which a user pushed changed the sounds. This type of touch-sensitive capacitive technology was forward-thinking and foreshadowed the common touchscreen operation of modern micro-computing technology used in trackpads, smartphones and tablets.

Buchla's major unique innovation was the sequencer, which could apply a predetermined series of voltages to the synthesizer. The sequencer allowed for repetitive and rhythmic patterns, in an effort to replace the making of tape loops. His first sequencers featured eight repeatable voltage steps, which in turn could generate eight voltage-controlled pitches from the oscillator. Later versions of the sequencer would double the steps to sixteen. It was his solution to Subotnick and Sender's problem of

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[43] Pinch and Trocco, 44.

tedious tape splicing. The sixteen step sequencer would theoretically remove the need for sixteen individual splices, and even more if run as a loop.[44]

Buchla brought his "Box," a voltage controlled analog synthesizer, to the Tape Center in 1965. It was an exciting development for electronic musicians and composers who envisioned the possibilities within the Buchla Box. Vladimir Ussachevsky ordered three of Buchla's modular systems and Buchla opened a small workshop in Berkeley to begin production. Buchla typically made custom units per order and did not have the mass market sensibility of Moog. A failed manufacturing venture with CBS in the late 60s dictated that Buchla's synthesizers would never have the mass market availability and commercial recognition of the Moog. [45] CBS, who had recently acquired the Fender guitar brand and sought other electronic instruments, failed to understand the market demand or experimental nature of a modular synthesizer. Buchla grew frustrated, and later disdainful, of CBS's attempts to turn his system into a simplified, mass-produceable product. After cutting ties with CBS, Buchla ultimately remained an independent

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[44] A sequencer is not exactly the same as a loop and behaves more like an electronic composition tool. The user determines which patches will play at each step, including adjusting the voltages, filters and other modulations. The sequence order and length can be varied by how many steps the particular sequencer allows for. Once the sequence has been designed and programmed, it can then be looped. As the steps repeat, the musician could filter and alter the sound to produce musical variation. This included possibilities for changing rhythm. Also, timbre could be shaped through filtering. It quickly expanded toward unexpected uses such as programming rhythmic sounds into an early form of drum machine.

[45] Pinch and Trocco, 49-52.

manufacturer and relied mostly on avant-garde composers and academic electronic music labs as his main clientele.

Buchla's box was much more experimental in terms of output, whereas the Moog's keyboard and frequency-voltage ratio allowed for playing predictable pitches within conventional scales. Buchla did not employ any sort of determining ratio, and therefore, would not stay in any kind of Western tuning. It produced a wash of sound and random noise that had to be tamed in order to be played. Buchla also differed from Moog in the conception of patch cords that interconnected the modules. Buchla used different cables for separate purposes. He opted for stackable, banana plugs to connect control voltages and phono plugs for audio signal voltages, whereas Moog relied on standard jack plugs for both. Here Moog was a bit looser in allowing for the voltages and audio to be mixed up if desired, while Buchla's system was designed to give the musicians a visual representation between audio signal and control voltage paths. Buchla's system relied on an understanding of the discrete paths of synthesis. Since Moog's connections were all the same, trial and error could result in desirable sounds even with no technical knowledge.

Buchla's unique approach is best exemplified by his random voltage and white noise generator. White noise contains all sound frequencies, which makes it a good starting point for subtractive synthesis. Buchla combined this module with a random voltage generator that would send random control voltages to the oscillators resulting in sounds that were a complete surprise to the operator, who could then try to react by

filtering and modulating the events in real time. Instead of using the technical names, Buchla called this module "the source of uncertainty," and it amounted to a virtual roll of the dice.[46] The introduction of chance to composition was more in line with the experimental attitude of the West Coast scene that Buchla participated in, rather than the more conventional approach of Moog.

Sender hung out among the hippie scene in the Haight-Ashbury, establishing a relationship between the counterculture and the experimental music of the Tape Center. Pinch and Trocco highlight the cultural importance of this relationship, "We usually think of the counterculture as anti-technology but the new technologies of sound and light, combined with mind-altering drugs, were an integral part of the movement."[47] Tape manipulation was a favored technique of Ken Kesey in producing "trippy" soundtracks for his acid tests. Once the synthesizer prototype had been built, Buchla and his new invention would became a fixture of the psychedelic parties. The Buchla even made a cameo in Tom Wolfe's portrait of Kesey and the Merry Pranksters, *The Electric Kool-Aid Acid Test*, "The music suddenly submerges the room from a million speakers… a soprano tornado of it… all-electric, plus the Buchla electronic music machine screaming like a logical lunatic."[48]

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[46] Pinch and Trocco, 47.

[47] Pinch and Trocco, 316.

[48] Tom Wolfe, *The Electric Kool-Aid Acid Test* (New York: Picador, 2008), 392.

These affiliations with the San Francisco acid rock scene led to Buchla's involvement in large-scale psychedelic music events. Buchla's box was used as a centerpiece of the Trips Festival in 1966, a happening put on by Sender and Stewart Brand. Kesey paraded the grounds in a space suit as the Grateful Dead played while being modulated through the Buchla. At other times, the box created its own electronic soundscape to freak out festival attendees in conjunction with changing colors, film projections and strobe effects. Later, Buchla and Brand would close out one of Brand's subsequent events, the Awareness Festival, by performing together on the Buchla box to parody a missile strike by the Russians.

After Subotnick moved to New York, the Tape Center relocated to Mills College, under the direction of Bill Maginnis and Pauline Oliveros, and the countercultural atmosphere dissolved in its academic setting. The Buchla box was rebranded as the Buchla Series 100 Modular Electronic Music System, which Subotnick would use on *Silver Apples of the Moon* (1967). The experimental album, commissioned by the classical label Nonesuch Records, is still a challenging listen, featuring only sounds produced by the Buchla 100 on two scores of electronic music roughly a quarter hour each in length. The album's music is comprised of intermittent bleeps, bloops, ambient pads, moments of intense distortion all in irregular patterns. The sounds coalesce into a rhythmic pattern midway through the second half, albeit scattered and full of dissonance, but the piece begins to foreshadow later styles of electronic dance music. *Silver Apples of the Moon* preceded *Switched-On Bach* as a commercial record made entirely of analog

synthesized sounds, but never had the crossover success of Carlos's record, largely due to her choice to use familiar material while Subotnick highlighted the more experimental possibilities of the new instrument.

By the end of the 1960s, the synthesizer had clearly made an impact on popular music and Moog began thinking about new ways of attracting musicians to the instrument, test new modules and drive up promotion on the East Coast. He turned part of his Trumansburg shop into a studio space for musicians and composers to rent. His shop developed an odd local reputation as bizarre characters, like the Afrofuturist jazz great Sun Ra, began visiting the sleepy, upstate town of Trumansburg. This venture allowed composers and musicians to come and experience the Moog synthesizer and learn the basics of subtractive synthesis. It also provided Moog instant feedback on what types of modules and sounds musicians desired and what types of damage musicians without a technical background might inflict on his machines. Moog cleverly used this knowledge to foolproof his design and push the synthesizer toward a more stable instrument that could be performed with live. The Moog synthesizer had always been designed as a studio instrument. Its massive size and complicated circuits would not fare well with the the rigors of touring. Furthermore, the oscillators frequently fell out of tune depending on the room's temperature and the machine's own heat production while in operation. These issues would have to be addressed as musicians would inevitably want to bring their Moog on the road.

The synthesizer became a lead instrument in the hands of keyboardist Keith Emerson. A pioneer of progressive rock—a blend of rock, classical and jazz influences—Emerson had success as a member of The Nice during the 1960s before forming the supergroup power trio Emerson, Lake & Palmer (ELP). Like many others, Emerson's first experience with the Moog was hearing *Switched-On Bach*. He already played the Hammond electric organ, but after borrowing Mike Vickers' Moog, Emerson became fascinated with the complicated set of metal boxes and patch cords and decided that he had to have one.[49] A recording advance from Atlantic Records funded the purchase and Emerson began experimenting with patches, with help from Vickers, for ELP's self-titled debut album.

Emerson's solo in "Lucky Man" on *Emerson, Lake & Palmer* (1970) stands as one of the key moments in the history of the instrument. The electronic sound provides a sharply defined contrast to the acoustic instruments. The sound of the Moog arrives as an event, a turn from adding ambient noise textures to a prominent, feature as solo instrument. The synthesizer defined Emerson's sound in ELP and he became the first notable musician to tour with the Moog synthesizer. Moog began developing prototype modules for Emerson and working on stabilizing the instrument to stand up to the touring musician's demands. His custom synthesizer grew to a monstrous ten foot tall wooden box filled with black metal boxes, hundreds of knobs and a spiderweb of multicolored

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[49] Mike Vickers was a multi-instrumentalist in the popular British act Manfred Mann in the 1960s.

patch cables. Emerson turned the Moog into a rock star's instrument, capable of standing up against the electric guitarist. He performed similar phallic gestures with the Moog's ribbon controller, itself a long metal box that housed a sheet of conductive metal.

There was an empty market for a stable and more portable touring synthesizer once Emerson broke the live performance barrier. After hearing *Switched-On Bach*, former NASA engineer Alan Robert Pearlman also began designing a synthesizer. Pearlman, like Moog and Buchla, had dual interests in engineering and music. He had studied at Worcester Polytechnic Institute where he designed an envelope follower that could determine the attack and decay characteristics of specific instruments. Pearlman then worked for NASA and gained an expertise in transistor technology and building operational amps. He cofounded Nexus Research Laboratory, Inc., which became a successful op amp producer by the mid-60s.

The sale of Nexus allowed Pearlman to start ARP Instruments Inc., with the initial goal of solving the tuning problems that plagued early synthesizers. Pearlman used his knowledge of op amps to fix this issue by placing dual transistors on a single circuit.[50] Pearlman also changed from patch cords to slider switches. Players could uses the sliders in a matrix to control the signal paths in place of the confusing array of cables, allowing for a streamlined visual system that explained how synthesis worked.

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[50] This type of circuit design would also be Moog's eventual fix in later versions of the Moog designed for live performance, such as the portable Minimoog.

The ARP 2600 became Moog's first real competitor in the synthesizer market. Although Buchla introduced the new Buchla 200 system in 1969, his very limited output made it a custom, niche synthesizer that never impacted the mass market. Buchlas continued to be used almost exclusively in academic electronic music labs and by a handful of professional synthesists.[51] The ARP 2600 was a partially modular synth, meaning that modules could be added with some patching capabilities, but the ARP featured a core of prewired internal patches that allowed operators to produce sound immediately and tweak parameters on the front panel's slider matrix. This out-of-the-box playability made the ARP more accessible to novices, unlike the Moog that had to be patched to produce sound and did not come with any instructional material. The ARP was cheaper than a full Moog synthesizer and packed up into a convenient portable carrying case. Oscillators that stayed in tune also became a major selling point. High-profile musicians gravitated toward the ARP 2600 and the synthesizer had its first major moment on record when Pete Townshend played the ARP in the intro to The Who's "Baba O' Riley."[52] The synthesizer also had historic moments in film history, including the soundtracks of '70s science-fiction classics *Close Encounters of the Third Kind* (1977) and *Star Wars* (1977), where it provided the voice of robot character R2D2.

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[51] Although Buchlas are rarely credited on popular music works, synthesist Suzanne Ciani used the Buchla 200 extensively in creating sound logos and advertising, similar to the type of work Eric Siday had produced with an early Moog. Her most famous sound was the trademark pop of Coca-Cola.

[52] The Who's "Baba O' Reily" appears on the album *Who's Next* released in 1971 by Decca/MCA in the United States.

After the success of *Switched-On Bach*, Moog's role in the company shifted significantly to the business end, giving demonstrations and finding investors to grow the company. Even though his brand was synonymous with the synthesizer, few outside of the top paid musicians and record companies could ever afford a Moog. Facing new competition from ARP, Moog's operating debts mounted with no indication that sales would ever pick up. Moog and his team decided that a portable, mass-produced synthesizer could be the answer. Engineers Bill Hemsath and Jim Scott began building circuits and prototyping a compact version of the Moog.

Hemsath's Model A Min Moog featured a hardwired circuit design that did not require patching modules. The synthesizer was one unit, featuring a control panel with knobs and switches to control and manipulate parameters while operating. A second version, the Model B Min Moog was built into a more aesthetically pleasing traveling case. With a working prototype, Hemsath and Scott headed a team of engineers that quickly brought the Min Moog from the design stage to a production model within the year.

The Minimoog, made in 1970, transformed the Moog synthesizer into a smaller, portable performance instrument. The front panel was a single unit instead of individual modules, making the unit an all-in-one system with popular patches hardwired into the back of the panel and housed inside the casing. The panel featured a flow that could essentially teach synthesis to novice musicians. The sound began with the three oscillators and moved from left to right through the envelope, voltage-controlled

amplifier and to the filters. Tactile knobs, switches and mod wheels made for a hands-on instrument that was more playable and intuitive than running patch cords in and out of jacks. The keyboard was integrated into the unit, strengthening the idea that the synthesizer was a keyboard instrument. A pitch wheel, located to the left of the keyboard, allowed for expressive pitch bending and vibrato. A second modulation wheel controlled filter parameters in real time. The two expression wheels were new to the Minimoog, but would become a standard feature in synthesizer design going forward.

The Minimoog was built to tour, with stable oscillators, a fixed bank of preset sounds and a playable keyboard within a convenient carrying case. It redefined the synthesizer, formerly a large, complicated and unpredictable studio machine. The idea of electronic music also shifted from creating intricate patches of experimental noise into the live shaping of preset tones while playing notes on the keyboard and turning knobs with the other hand. At the price of $1,195, the Minimoog was a much cheaper option compared to the full Moog systems selling for $10,000 or more.[53] The Minimoog became an affordable and accessible instrument sold at local music stores to any musician, amateur or professional.

ARP released its own portable synthesizer, the Odyssey, in 1972. The Odyssey featured a prewired, all-in-one design with an attached keyboard similar to the Minimoog. In place of knobs and switches, the Odyssey continued to rely on a slider matrix array on its control panel. The small synth was duophonic, capable of playing two

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[53] Pinch and Trocco, 231.

notes at the same time, while nearly all analog synthesizers were monophonic instruments.

ARP relied on famous musician endorsements for their print ads, featuring Pete Townshend, Stevie Wonder, Edgar Winter, and Jimmy Page, among others. As Moog engineer Jim Scott intimates, "ARP, with a product that didn't sound as good, wasn't as reliable, was more expensive, beat our pants off because they were doing the marketing right."[54] ARP's aggressive marketing in the 70s allowed the company to overtake Moog as the number one maker of synthesizers. In conjunction with the ARP 2600, the ARP brand defined the synthesizer's use in music and film throughout the '70s, as the Moog had done during the 1960s.

The Minimoog's success came too late for Robert Moog to keep control of his company. Moog's financial woes forced him to sell to investors who absorbed his growing debt. ARP Instruments Inc. began to struggle by the end of the decade as well, after an internal power struggle developed over investing large sums into failed development projects. The company ultimately filed for bankruptcy in 1981. Moog moved to Asheville, North Carolina and returned to making theremins for his new company, Big Briar. He recovered the the rights to his namesake company in 2002 and produced another wave of innovation in analog instruments and effects including the Moogerfooger guitar pedal line and the expanded Minimoog Voyager. Moog died of a brain tumor in 2005, but Moog Music Inc. continues to produce his signature musical

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[54] Pinch and Trocco, 269.

equipment and carries on his legacy through the Bob Moog Foundation. In 2015, Moog Music released faithful reproductions of the original large-format analog synthesizers that Moog had designed in 1964.[55]

The synthesizer seemed to lose its momentum in tandem with the dwindling spirit of the 60s cultural revolution. The experimental and subversive noise entered into the cycle of commercialism and normalization through the 1970s, until the aggressive noise politics of punk voiced its opposition at the end of the decade. However, the synthesizer still radically changed the way that sound is processed for artistic effect and had a significant influence on recorded sound. Synthesizer technology made its way into stompbox guitar pedals that filtered and modulated the solos of Jimi Hendrix, discussed in detail in the following chapter. Recording studios were filled with rack-mounted processing filters that could thicken bass tones, warble lush chords or increase gain into unnerving levels of static distortion. Cast-off analog synths and sequencers breathed new life on the underground dance music and early hip-hop records. The early days of the synthesizer professed the coming era of computer and digital technology as transistors and capacitors became integrated circuits and eventually microprocessing chips. As Pinch and Trocco point out, "the technologies and sounds of the counterculture were an (unlikely) source of today's mainstream digital culture."[56] Digital emulations still work

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[55] Three reproductions are currently available, the System 55, System 35 and the Model 15. More information available at "The Return of the Moog Modular," Moog Music Inc., accessed on March 9, 2015, http://www.moogmusic.com/news/return-moog-modular.

[56] Pinch and Trocco, 316.

on the principles of synthesis and nearly all mechanical devices feature some form of circuit design. Today, every mechanical device that sounds, beeps or alarms has a tiny synthesizer built into it.

CHAPTER THREE - TRANSMITTING FROM STATION EXP: JIMI HENDRIX AND ELECTRIC CONSCIOUSNESS NOW IN STEREO

"I like electric sounds, feedback and so forth, static."[1] — Jimi Hendrix

Jimi Hendrix's performance of the "Star Spangled Banner" at Woodstock stands as one of the most iconic moments in rock music history.[2] His interpretation reset the context of the patriotic tune for a divided country mired in the Vietnam War. Hendrix splintered the anthem with loud distortion, screeching feedback, aggressive picking and vibrato bar dives to invoke the chaotic sounds of war ripping apart his country. In response to criticism that his version was disrespectful to the symbolic song, Hendrix explained, "nowadays when we play it, we don't play it to take away all this greatness that America is supposed to have. We play it the way the air is in America today. The air is slightly static, isn't it?"[3] Beyond his status as the preeminent guitar virtuoso, Hendrix skillfully played the static, weaving electronic noise into his otherworldly soundscapes in the hopes that his electric church would inspire a different future. A deeper

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[1] John Burks, "The End of a Big Long Fairy Tale," *Hendrix on Hendrix: Interviews and Encounters with Jimi Hendrix*, ed. Steven Roby (Chicago: Chicago Review Press, 2012), 264.

[2] Although Woodstock's performance is the most famous, Hendrix frequently played the "Star Spangled Banner" in live sets, including another notable performance in 1969 at the Los Angeles Forum.

[3] "United Block Association Press Conference," in Roby, *Hendrix on Hendrix*, 217.

understanding of his ties to late-1960s' countercultural politics and a connection to Afrofuturism suggests a more socially engaged and politicized version of Hendrix.

There is a tendency to think of Hendrix as a mythical guitar virtuoso, a player so gifted that he never fretted a bad note. He magically appeared on Earth, delivered his futuristic sound to the love generation and then disappeared. Hendrix's mythology as a timeless eccentric has eclipsed the very real contributions he made to guitar tone, the art of recording, and his strong roots influences, from R&B to Bob Dylan. Hendrix advanced the possibilities of electrified music via amplification, guitar pedals, studio recording techniques and stereo mixing. He was methodical: rolling tape, editing his performances and sitting through long mixing sessions, striving for creative perfectionism. Perhaps these are the reasons that his music still sounds new more than forty years later. Hendrix revolutionized the way we think about recorded sound, as a material that can be transformed and shaped into powerful, three-dimensional vibrations.

In the previous chapter, I proposed that the synthesizer provided a new electronic sound source that inspired the '60s counterculture. In this chapter, I argue that Jimi Hendrix employed electronic sound as powerful social commentary in live performance, and also, to sonically invent a future utopia that transcended violence and racial division on his recordings. First, I will look to his use of distortion and noise politics as an antiwar political statement. Drawing on Steve Waksman's analysis of Hendrix and black identity, I will demonstrate how perceptions of black masculinity among a predominantly white audience caused Hendrix to escape the visual spectacle of the stage and retreat into

studio-based world creation.[4] Furthermore, I argue that Hendrix's recordings exhibit a strain of Afrofuturism that looks toward outer-space as an imagined utopia. Lastly, I examine Hendrix's three studio albums to link his use of stereo soundscaping with science-fiction thematic content. Through his embrace of technology and Afrofuturism, Hendrix assumes the prophetic role of musicians that Attali refers to as "innovators and heralds of worlds in the making."[5]

Hendrix began his career as a backing guitarist for various rhythm and blues acts after receiving an honorable discharge from the United States Army paratroopers division. He played behind rock n' roll pioneer Little Richard (1964-1965) and new acts, including the Isley Brothers (1964) and Curtis Knight (1965). Sharing the bill with Curtis Mayfield (1963), who used unusual tunings and playing technique, shaped the way Hendrix, a left-handed player, jazzed up chord voicings and thought about song arrangements, teaching him a lot about the rhythmic possibilities of the guitar. Hendrix's lead playing was deeply rooted in Chicago blues phrasing, string bending, and flurries of pentatonic notes in the style of another major influence, Buddy Guy, who made an impact on the scene after moving to Chicago in 1957. Even though his unique sound would be

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[4] Steve Waksman, "Black Sound, Black Body: Jimi Hendrix, the Electric Guitar and the Meanings of Blackness," *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience* (Cambridge, MA: Harvard University Press, 1999).

[5] Jacques Attali, *Noise: The Political Economy of Music* (Minneapolis: University of Minnesota Press, 1985), 19.

drenched with psychedelic effects, the music he played was steeped in African-American musical traditions.

By 1966, Hendrix moved to New York's bohemian Greenwich Village and fronted his own band, Jimmy James and the Blue Flames. He was discovered by former Animals' bassist Chas Chandler while playing a regular show at the Cafe Wha?. Chandler and and ex-Animals' manager Mike Jeffery signed Hendrix to a contract and brought him to London to begin playing concerts and record his first single, a cover of the traditional song "Hey Joe." Chandler rounded out the Jimi Hendrix Experience with guitarist Noel Redding to play bass and the phenomenal drummer Mitch Mitchell. The Experience were signed to a recording and distribution contract with Track Records, a new label formed by ex-Who managers Kit Lambert and Chris Stamp. Audiences were impressed with his enigmatic guitar playing and Hendrix began making television appearances, being interviewed for print press and garnering the admiration of famous peers like Eric Clapton, Pete Townshend, Brian Jones, and Paul McCartney. His first three singles, "Hey Joe," "Purple Haze," and "The Wind Cries Mary," all charted in the UK's top ten. Hendrix was a runaway success in England on the verge of recording his debut album.

Although *Are You Experienced* (1967) was met with commercial and critical success overseas, Hendrix stalled in the US market early on. Beginning his career prior to the Civil Rights Movement and spending years struggling as a rhythm and blues sideman, mainstream crossover success in the US would have been much more difficult

for a black artist, even with his raw talent. His trip to England was another example of African-American blues artists revered overseas while facing marginalization in their home country. Instead, British rock bands overtook the US charts with blanched covers of blues, soul, and Motown songs. Hendrix's first single failed to make an impact in America until his breakout performance at 1967's Monterey Pop Festival launched his stateside career. He was added to the bill thanks to resounding praise from Paul McCartney, and played a feverish set of blues covers and originals. The performance ended with Hendrix famously setting his guitar on fire and summoning the dancing flames while kneeling before the burning guitar, an act that has been analyzed and interpreted in many accounts.

Over the next couple of years, Hendrix released two more studio albums, *Axis: Bold As Love* (1967) and *Electric Ladyland* (1968), and toured extensively in the US and abroad. In 1968, he left London and returned to New York to record; sensing a stylistic shift, he subsequently split with Chandler and began experimenting with new band lineups. By the time Hendrix headlined Woodstock, he had quickly ascended to the top of the popular music scene on both sides of the Atlantic. The band he assembled for the performance was nicknamed Gypsy Sun and Rainbows, featuring longtime Army friend and collaborator Billy Cox on bass, Mitch Mitchell on drums, rhythm guitarist Larry Lee and two percussionists, Juma Sultan and Jerry Velez. As delays pushed the headlining band late into Sunday night, Hendrix instead played to the smaller, dissipated crowd on Monday morning, a sunrise moment caught exquisitely by the talented *Woodstock* camera

crew (including the young Martin Scorsese). Hendrix's rendition of "The Star-Spangled Banner," raw, virtuosic, and discordant with feedback, remains the most famous musical moment of the festival and a telling warning of how difficult a task changing the world would prove to be for the love generation.

It is clear that Hendrix's instrument functioned as an extension of his body when watching him masterfully coax the pained squeals and destructive sonic explosions that politically recontextualize the song as an antiwar anthem. His image will be forever linked to the Fender Stratocaster, or Strat, particularly the white model that he played at Woodstock.[6] The Stratocaster offers a biting, clean sound, even at higher volumes, and the treble pickup can be incredibly slicing for lead guitar soloing. Hendrix's preference for Fender likely had to do with the cutaway shape, which facilitated turning the guitar for a left-handed player. Also, it was the favored guitar of Chicago bluesman Buddy Guy, who was the biggest influence on Hendrix's soloing style. His endorsement ensures that the Strat remains a guitar of choice for generations of players, hoping to gain a little of the Hendrix's musical spirit.

Similar to early synthesizer inventors Moog and Buchla, guitar-maker Leo Fender developed a love of electronics as an amateur radio hobbyist during his teenage years. Spending the early 1940s developing guitar prototypes and working on pickups for lap steel guitars, he started the Fender Electric Instruments Company in 1946 in Fullerton,

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[6] The Fender Stratocaster began production in 1954 and has continued to be one of the two most popular and imitated electric guitar designs, along with the Gibson Les Paul.

California with the intention of engineering and manufacturing an affordable electric guitar. He realized his vision by 1950, becoming the first to commercially mass produce a consumer-priced electric model called the Broadcaster, which was later renamed the Telecaster or Tele.[7] The model has remained popular among country musicians for its unique twang.

The Stratocaster, released for production in 1954, featured upgrades to the simple Tele design meant to provide guitarists with added versatility and sonic capabilities. The most distinctive feature was the new double-cutaway shape that emulated the popular tail fin cars of the 1950s. This modification allowed greater fret access than the single-cutaway Tele or Les Paul, especially for a left-handed player.[8] Most electric guitars had two pickups, but the Strat featured three single-coil pickups, a volume knob, two tone controls and a corresponding three position switch that allowed the guitarist a greater range of output options by selecting different pickups. The lead pickup's tonal bite, an

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[7] Gretsch had a claim on the name Broadcaster, forcing Fender to rename the instrument or face litigation. The Telecaster echoed the television, another electronic mainstay of 50s culture, and featured two single-coil pickups and a string through body, bolted-neck design that particularly suited the clean, bright tone of early amplifiers.

[8] Surveying his early guitars, it is clear that the double-cutaway was the most common factor among them. A red 1956 Silvertone Danelectro guitar, purchased for Hendrix by his father, features a double-cutaway symmetrical body and one lipstick pickup. Later, while backing up Curtis Knight and the Isley Brothers, Hendrix was frequently pictured with a 1964 Fender Duo-Sonic, a budget double-cutaway electric. Other brief stints with the Fender Jazzmaster and the Gibson SG confirm that the double-cutaway was a choice of practicality for the left-handed guitarist, who rarely used the heavier single-cutaway Gibson Les Paul model, which would prevent him from playing above the thirteenth fret on the treble strings. Cutaway guitars characteristically feature smaller bodies built for speed and biting tone.

ideal characteristic for distorted rock music, cut through other instruments in live performance. This sonic trait made it an ideal soloing instrument, especially in the hands of a virtuoso like Hendrix. Finally, a spring-loaded vibrato arm was added to the bridge to allow expressive pitch bending by pulling up or depressing the lever. Like the Telecaster, the Strat was easy to mass produce thanks to its modular pieces, bolt-on neck and routed electronics. Fender's original Strat design provided playability and versatility making it a popular choice for Hendrix and many others. The design proved so perfect that the Stratocaster continues to thrive sixty years later with minimal changes.

The electric guitar is a hybrid-electronic instrument, meaning it has both acoustic and electric properties. It translates as an instrument, unlike the previously discussed modular synthesizers, which are purely electronic. The body and strings of the electric guitar vibrate in the same way that its acoustic counterpart does, however the magnetic pickup reacts to the push of the steel strings' motion and the coil converts this energy into a signal, which is fed to the amplifier. Since Hendrix mostly played stock Stratocasters, his tone is defined by the instrument's characteristic three single-coil pickup set.[9] The

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[9] Fender's pickups feature six individual magnets per pickup, arranged by string, and wrapped by circular wire coil. Using individual magnets, in place of the Gibson-style solid-bar magnet pickup, results in a clearer, but thinner tone. The single-coil pickups were bright, or trebly, as Fender wanted to accentuate the treble range of the guitar to cut through the band as a solo instrument. In an effort to bring out even more sonic options from his Strat, Hendrix often stuck cigarette foil wrapper into the three-position pickup switch to lock into the in-between positions. The modification changed the phase of the pickups and actually worked like a double-coil Humbucker to cancel the noisy hum of the single-coil, resulting in a quieter sound that Hendrix used on slower tempo ballads. This creative modification inspired pickup maker Seymour Duncan to create the five-position pickup switch, now standard on most Stratocasters.

Strat's pickups were a bit more subdued than the especially hot-wired Tele bridge pickup, but its magical neck pickup became a sweet spot for modern, bluesy rock in the hands of Hendrix, Clapton, and Stevie Ray Vaughan.[10] Hendrix used the neck pickup for especially pretty rhythms on ballads or slower-tempo bluesy solos. The bridge pickup was wired for more output, allowing the guitarist to switch to it for clear, cutting lead tones or overdrive the signal into noisy feedback.[11]

Being left-handed, Hendrix played by flipping a right-handed guitar upside down. In this reversed configuration, the tremolo bar now hung over the strings and could be wrenched and pulled for dramatic pitch-bending, another signature technique of Hendrix's playing style used to create the wavering bomb effects in "The Star-Spangled Banner" or "Machine Gun." The volume knob sat underneath Hendrix's picking hand, allowing him to artfully open up or dial back the full power of his pickups. When at full volume, Hendrix could exploit the wild, screeching feedback of his guitar and amplifier. Dialing back the volume cleaned up the distorted tones and provided a shift in the song's dynamics. Hendrix creatively used his volume knob for effect, as in the opening of "Foxy Lady," where he pre-picks an F# and aggressively vibratos the string with the

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[10] Although lower in output, neck pickups are warmer with greater nuance because of their position on the guitar, taking full advantage of the wood's resonance and the wider arc of the guitar string's vibrations.

[11] Dave Hunter, *The Guitar Pickups Handbook: The Start of Your Sound* (New York: Backbeat Books, 2008), 25-47, 80-101.

volume rolled off, then turns up the volume to crescendo in a wail of feedback that serves as the song's introduction.

Hendrix pushed the boundaries of sound and the electrical limits of his equipment. But the guitar was only the first piece of technology in his advanced sonic arsenal. It was the brutal pairing of his screaming Stratocaster with the Marshall amplifier that came to define the most legendary sound in rock history. His feedbacking, overdriven timbres revolutionized the sound of rock music as much, if not more, than the way he played. The Marshall amplifier provided the distortion and sheer volume that Hendrix desired to gave his music a overwhelming, bone-rattling power.

While in London in the mid-1960s, Hendrix met amplifier designer Jim Marshall and switched from the Fender Twin Reverb to Marshall's Super Lead Model 1959 amplifier head and cabinet, often referred to as the Marshall "plexi."[12] The Marshall amps provided significantly more distortion than his previous Fenders and the switch was integral to Hendrix's rowdy tone. By daisy-chaining multiple amps together, Hendrix played with an tremendous amount of volume and feedback became an inevitable consequence. Most players shy away from the screeching noise, but Hendrix took the opposite position, facing his amps to invoke the chaotic sounds. He wrestled the screams

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[12] The 100 watt Marshall Super Lead was originally developed as a louder amp for Who guitarist Pete Townshend. It was available as of 1965. "Plexi" came from the plexiglass control panel where the knobs and inputs were located. A gold colored metal plate would later replace the plexiglas panel in 1969.

of his amps and harnessed the undesirable noise, using it to his advantage in a frenetic and electrically charged sonic assault.

Hendrix's heavily distorted tones and sonic effects could not be achieved through his guitar and amplifier alone. He relied on a series of metal pedals built on transistor technology, an offshoot of the synthesizer, to saturate, modulate, and filter his tone. Hendrix's stompboxes were custom built or modified by electronics specialist Roger Mayer, who worked as an engineer for the British Admiralty Research Laboratory during the Cold War before meeting Hendrix at a music club in 1967. Mayer became a studio mainstay through the *Are You Experienced* and *Axis: Bold As Love* sessions in London, and followed Hendrix on his 1968 US tour and the subsequent recording sessions for *Electric Ladyland*. Michael Heatley points to the importance of their partnership, "After a winter 1968 tour of the States with Jimi, Mayer left the Admiralty to concentrate on sound technology. Jimi called him 'the secret of my sound.'"[13] In addition to producing original units, like the Octavia, Mayer personally modified many of Hendrix's pedals. Thanks to Mayer, Hendrix's pedals were the only part of his guitar rig that was far from stock, making it difficult for any other guitarist to achieve his sounds even with similar equipment. His signal chain ran from his Fender Stratocaster, to a wah-wah pedal, then the Fuzz Face, followed by the Octavia, and finally the Uni-Vibe, before plugging into the Marshall Super Lead. It is a modest pedalboard by today's standard; however,

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[13] Michael Heatley, *Jimi Hendrix Gear: The Guitars, Amps & Effects that Revolutionized Rock 'n' Roll* (Minneapolis: Voyageur Press, 2009), 88.

Hendrix was one of the first guitarists to utilize stompboxes as an integral part of his sound and he could click these new sounds on and off at will, acting like a simple modular synthesizer between his guitar signal and his amplifier.

Hendrix was not just a great guitar player, but someone who experimented with the most cutting-edge guitar technology to produce innovative music unlike any of his contemporaries. In live performances, he presided over the technology with a natural virtuosity, captivating his young audience. As Waksman points out, "The issue is not whether the instrument created volume, distortion, and other sonic effects, but whether the creation of these effects, the noise of the electric guitar, marked a reorganization of musical practice or the reconceptualization of social and political differences through music."[14] For Hendrix, music had the ability to inspire social change through its powerful message.

Hendrix's critique of the war, at the musical climax of the 1960s, coincided with major social unrest across the country. Throughout the decade, a youth counterculture developed as a rejection of mainstream America or, as they viewed it, the straight world. In contrast with their parents, the Woodstock generation explored an eclectic assortment of Eastern spirituality, free love, communal living, and alternative lifestyles. An embrace of marijuana and psychedelic drugs served as a gateway to mind-expanding vision. By 1967's famous Summer of Love, rock n' roll and rock music had become two increasingly different genres. Rock n' roll's spirited, rhythmic energy remained, but

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[14] Waksman, 12.

fused with folk, blues and psychedelia. Acid rockers, the Grateful Dead, improvised the soundtrack for Ken Kesey's acid tests in San Francisco. The Beatles brought psychedelic vision into the mainstream on songs like "Tomorrow Never Knows" and the landmark album *Sgt. Pepper's Lonely Hearts Club Band* (1967). Syd Barrett's Pink Floyd released their psychedelic first album, *The Piper at the Gates of Dawn* (1967), and set off on a UK tour opening for Hendrix. Expressive musical possibilities were unregulated in terms of song form, lyrics, timbre, studio sound manipulation, and conceptual artistic themes.

Juxtaposing the national anthem with an overdriven electric guitar musically echoed the counterculture's plea for social change. According to Waksman, in the Woodstock performance, "Hendrix translated the fractiousness of the war at home and abroad and the damage it did to American patriotism into a war between music and noise that was at once a supreme act of defamiliarization and a stunning political critique."[15] Here, Waksman draws on Attali's theory of the political economy of music, in which noise is issued as a declaration, an incongruous fracture between old and new ways of thinking. The cacophony within such a weighted piece of music represented the turmoil experienced by a younger generation, directly impacted by the violence of war, pushing toward a complete break from the past generation's sense of conservative morality, global politics and Cold War ideology. Within Attali's framework, a noise this loud must be silenced or overtake the established order. Hendrix was a countercultural tastemaker, but in this context, he was also politicized.

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[15] Waksman, 172.

The postwar baby boomers were maturing and becoming increasingly politicized as well, taking on socially progressive causes from the Civil Rights Movement to opposing the war in Vietnam. Hendrix's expressive use of noise as a political statement expressed the anger of his generation. In contrast, on spacey utopian songs, Hendrix appeared as a cultural shaman from the future where the sounds of war were overtaken by synesthetic tone colors and rhythms of love. He took on a timelessness, like a prophet from another planet, who came to help the Earth when it needed a new message. This mystical legacy remains with Hendrix to this day, who is more likely to be thought of as a superhuman guitar-slinging oracle, too talented and clairvoyant to remain bound by the human world. For a time, personal freedom encapsulated the optimism of the shifting tides and Hendrix's message of love provided inspiration.

The '60s peace movement desperately tried to reconcile future uncertainty and the constant threat of violence, domestically and abroad. The Vietnam War's bodycount continued to rise, while America's cities were burning as racial tension and slow progress in the wake of the Civil Rights Movement boiled over. Politicized factions from the Weathermen to the Black Panthers became increasingly militarized and radical. Hendrix felt pressure from the Black Power movement, forming the black power trio, Band of Gypsys, with Billy Cox and Buddy Miles in an effort to show a sense of racial solidarity. Facing management pressure to return to England and reform the Experience, contract litigations and a grueling touring and recording schedule, Hendrix frequently complains of exhaustion in his later interviews. Similarly, the counterculture began losing

momentum by the end of the '60s, facing the disappointment and disillusionment of failing to enact a fully realized social revolution. The *Band of Gypsys'* guitar and feedback tour-de-force, "Machine Gun," made another political statement comparative to his version of the "Star Spangled Banner." However, this time, the threads of patriotism from the iconic anthem are gone, all that remains is the pure havoc of violence and death. Hendrix tells the audience at the end of the performance, "Yeah, that's one we don't want to hear anymore, right?"[16] The extremes of distortion and noise reflected the growing political exasperation.

Hendrix's used electronic noise and his guitar as a form of power, one that had real political implications when critiquing the Vietnam War. However, toward the end of his career, Hendrix distanced himself from live performance, fearing that he had become a visual spectacle at the expense of his musical message. Addressing this tension, Waksman provides an excellent analysis of Hendrix, his guitar and the meanings of blackness, especially in regards to the complicated history of white perceptions of black masculinity.[17] Waksman argues that the sexual aggressiveness with which Hendrix wielded his guitar amounted to a mastery of the instrument as a sort of "technophallus." In his view, "The electric guitar as technophallus represents a fusion of man and machine,

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[16] Spoken word from transcription, *Band of Gypsys: Guitar Recorded Versions* (Milwaukee: Hal Leonard, 1998).

[17] Waksman's treatment of body, race and Hendrix occurs in the second half of his chapter "Black Sound, Black Body," in *Instruments of Desire*, 187-206.

an electronic appendage that allowed Hendrix to display his instrumental and, more symbolically, his sexual prowess."[18]

Clapton noted that Hendrix originally exploited his sexual power, but later reacted with disdain toward audiences who demanded the wild, erotic gesticulations as central to his performance. His eroticism became bound with the free love philosophy of the hippies alongside uncomfortable racial overtones, as a black icon in a mostly white counterculture. Here, Waksman draws on Frantz Fanon's work on the epidermalization of blackness and the threat of black masculinity to place Hendrix within a complicated history of racial stereotyping of the black male body within the white colonial imagination.[19] White women desired Hendrix, and white men wanted to be like Hendrix. Thus, for the male audience, acquiring the same technologies—guitars, amplifiers, and pedals—became an attempt to assume some of his sexual power by working with the same phallic tools. For Waksman, "it is the white woman's response that matters, her ecstasy that authenticates the power of Hendrix's 'Experience.'"[20] The adoration of Hendrix's body as a sexual object, by both female and male members of his audience, ultimately turned into "a situation that is essentially a form of minstrelsy."[21]

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[18] Waksman, 188.

[19] Waksman, 190-191.

[20] Waksman, 195.

[21] Ibid.

The Black Aesthetic movement remains important to Waksman's study since it offers a parallel context celebrating black art, in particular blues and jazz. A seminal work of Black Aesthetic theory, Amiri Baraka's *Blues People: Negro Music in White America* (1963) argued that the African-American experience in the United States could be best explained through music, which was crucial to forming the African-American identity. The movement adhered to racial divisions as a challenge to the hegemony of white male culture.[22] The collective improvisation of free jazz, a style emanating from Ornette Coleman's 1961 album, was considered the height of black musical expression. Perceived as authentically rooted in blues and black musical tradition by a white audience, Hendrix's embrace of rock music ran counter to the Black Aesthetic movement, which viewed the genre as parasitic of black culture. Hendrix contradicted the black aesthetic model by embracing rock music, electronic technology, and more importantly, shying away from hard racial divisions. Waksman makes the final point that, "Figures like Hendrix, who refuse to contain themselves within a single cultural tradition, force us to reexamine the value of racial (and sexual and aesthetic) boundaries."[23] Although aligning with the Black Power movement at times, especially in the Band of Gypsys, Hendrix's understanding of race generally featured a message of transcending division, rather than celebrating a distinctly black aesthetic culture.

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[22] Waksman, 173-178.

[23] Waksman, 178.

For a time, the electric guitar represented a more powerful method of communication for Hendrix than his voice as a black man in the United States during the 1960s. His artistic credibility and use of noise as social commentary lent gravity to his vision of a progressive, youth-led realignment on race relations and the war. However, when his ability to effectively participate in social commentary waned due to a fetishization of his body and the commercialization of the electric guitar, Hendrix spent more and more time recording in the studio. Explaining his withdrawal from public performance, Waksman states, "For Hendrix, as for Fanon, the sight of blackness in the eyes of others had become oppressive, and so he expresses a desire to be heard, not seen; listened to, not watched."[24]

Departing from Waksman's focus on the guitar and black masculinity, I argue that Hendrix's studio recordings connect him to an emerging culture of Afrofuturism, as heard in the science-fiction themed jazz of Sun Ra. Clearly, Hendrix was equally, if not more, passionate about recording as he was about performance. His distorted guitar and reinterpretation of the "Star Spangled Banner" allowed him to present violence as a dystopian version of the United States at war in a live context. However, on record, Hendrix's dream-like explorations of outer-space offered a a separate, utopian impulse. Here, Hendrix created worlds of synesthetic music, transcended racial boundaries, and spread a message of love for the future.

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[24] Waksman, 205.

Toward the last phase of his whirlwind career, Hendrix moved increasingly toward the science-fiction fantasy world of outer space. He dove into long, informal jams and began building a space-themed, state-of-the art recording studio, Electric Lady, to translate his new sounds to tape. Perhaps he was looking for escape like much of the tuned-out youth culture, or maybe he was on the verge of creating new mythologies with a futurist vision. African-American music scholar and musician Greg Tate places Hendrix in a unique cadre of Afrofuturist black musicians: "the three main people who we think in terms of a futurology in black music—Sun Ra, Hendrix, and George Clinton —they all had these mythologies. One set of mythologies that dealt with space, and another one that dealt with underwater, kind of as the other notion of space."[25] These themes exponentially appear in his lyrics and sonic presentation from album to album. Sadly, due to his sudden death, listeners would never know the next phase of Hendrix's sonic explorations. The idea of Hendrix's music as an Afrofuturology offers a different perspective on a complicated musical legacy.

Cyberculture scholar Mark Dery coined the term "Afrofuturism" in an interview with Samuel Delany, Greg Tate, and Tricia Rose for his collection of essays, *Flame Wars: The Discourse of Cyberculture*, which grew out of a special issue of *The South Atlantic*

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[25] Camille Goodison, "Negrocity: An Interview with Greg Tate," *Callaloo* 35, no.3 (Summer 2012): 633.

Quarterly.[26] Dery defined the term as "speculative fiction that treats African-American themes and addresses African-American concerns in the context of twentieth-century technoculture—and, more generally, African-American signification that appropriates images of technology and a prosthetically enhanced future."[27] Dery began his line of inquiry after realizing how few African-American writers worked in the genre of science-fiction, even though its themes of alienation, otherness and technological enslavement seemed a parallel to aftereffects of African diaspora. The genre remained overwhelmingly dominated by white male voices. Science-fiction author Samuel Delany explained that "the imagistic paraphernalia of science fiction functioned as social signs… They signaled technology. And technology was like a placard on the door saying, 'Boys Club! Girls, keep out. Blacks and Hispanics and the poor in general, go away!'"[28]

Dery was not the only academic beginning to form a canon of black authors, artists, and musicians into a subheading of scholarly inquiry. In an essay for *Science Fiction Studies*, Mark Bould points out that music writer Mark Sinker was assembling a "pantheon of black sf [speculative fiction]" a year before Dery in *The Wire*, including writers Samuel Delany and Octavia Butler alongside musicians Sun Ra, Public Enemy,

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[26] Flame Wars brought together a few new pieces to add to Dery's edited special issue of *The South Atlantic Quarterly* released in Fall 1993. Dery's "Black to the Future" introduces the term Afrofuturism.

[27] Mark Dery, "Black to the Future: Interviews with Samuel R. Delany, Greg Tate, and Tricia Rose," *Flame Wars: The Discourse of Cyberculture*, ed. Mark Dery (Durham: Duke University Press, 1994), Kindle edition, loc. 3166 of 6208.

[28] Dery, loc. 3247 of 6208.

John Coltrane, Miles Davis, Afrika Bambaataa and Jimi Hendrix.[29] Dery also found that Afrofuturistic themes existed across a multitude of artistic platforms, citing musicians Hendrix, George Clinton, Herbie Hancock, Lee Perry and Sun Ra, as well as the films of John Sayles and the art of Jean-Michel Basquiat and Rammellzee. Tate explains that Afrofuturist themes frequently occur in genres and mediums outside of speculative fiction: "The imaginative leap that we associate with science fiction, in terms of putting the human into an alien and alienating environment, is a gesture that repeatedly appears in the work of black writers and visual artists."[30] Therefore, Afrofuturism becomes more of a theme to be traced across a variety of disciplines.

Afrofuturist theorist Kodwo Eshun argues that the draw for black artists to participate in science fiction offers, "possibilities for intervention within the dimension of the predictive."[31] Afrofuturism allows for an invention of a mythology to replace the missing history of the African diaspora. As Delany says, "The historical reason that we've been so impoverished in terms of future images is because, until fairly recently, as a people we were systematically forbidden any images of our past." For this reason, Delany explained, "We need images of tomorrow, and our people need them more than

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[29] Mark Bould, "The Ships Landed Long Ago: Afrofuturism and Black SF," *Science Fiction Studies* 34, no.2 (Jul 2007): 180.

[30] Dery, loc. 3630 of 6208.

[31] Kodwo Eshun, "Further Considerations on Afrofuturism," *CR: The New Centennial Review* 3, no.2 (2003): 293.

most."[32] Futurology serves as a reinvention where subjugation can be overturned and mastery of technology represents empowerment. Therefore, Hendrix and Afrofuturism offer an alternative track to the Black Aesthestic movement, which viewed technology as an intrusive threat to black culture.

Tate further explains that "the existential black condition in America is very futurological, very future leaning. It's all about deliverance in its vision—post-emancipatory, post-liberation…some idea of a utopia, or promise land, or even just another state of being."[33] Afrofuturist music scholarship mainly centers around jazz pioneer Sun Ra, who fashioned a complex mythology around an extraterrestrial origin story and appropriation of Egyptian mythology. He served as bandleader for his unique jazz Arkestra and became one of the first to embrace the electronic synthesizer as a primary instrument. Africana studies and hip-hop historian Tricia Rose explained that, "Sun Ra's flying saucer imagery is about accepting the mystical powers that one knows, culturally, and seeing science as a mystical process as well—a process that has to do not only with deductive reasoning, but with creating power and positing new social myths."[34] Sun Ra participated an an extreme theater of self-reinvention, obscuring the details of his personal life and insisting on the reality of his assumed identity.

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[32] Dery, loc. 3293 of 6208. Quote at loc. 3646 of 6208.

[33] Goodison, 624.

[34] Dery, loc. 3715 of 6208.

Like Sun Ra, Hendrix participated in a reinvention process that resulted in his space-gypsy persona, complete with name change.[35] Hendrix's mythology drew from science-fiction, but also the love philosophy of the '60s counterculture. Hendrix and Sun Ra would both be major influences on a lineage of Afrofuturist black musicians. The most obvious connection is the space-funk of George Clinton's Parliament-Funkadelic. Clinton mixed Sun Ra's mythology and synthesizer with the psychedelic sounds of Hendrix to create his own brand of P-Funk. Clinton assumed the identity of Starchild and used a spacecraft, named the Mothership, as an onstage prop, coming in for a landing to bring the funk to Earth. The P-Funk mythology came into its own on the science-fiction concept album *The Mothership Connection* (1975) and a series of sequels. Hendrix devotee, André 3000 mainstreamed Hendrix-ian Afrofuturism in hip-hop with Outkast's *ATLiens* (1996) and *Aquemini* (1998). Most recently, Janelle Monáe has incorporated

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[35] Sun Ra legally changed his name from Herman Blount to Le Sony'r Ra in 1952. Hendrix was born Johnny Allen Hendrix in 1942, before his parents changed his name to James Marshall Hendrix when he was four years old. Hendrix changed his nickname Jimmy to the more exotic Jimi at the insistence of manager Chas Chandler.

Hendrix's Afrofuturism influence on her new millennium R&B, *The Electric Lady* (2013).[36]

It is also important to realize '60s counterculture was not necessarily anti-technology, as discussed in the previous chapter. Hendrix dedicated himself to the guitar, but also had an intense curiosity about cutting-edge music technology in the recording studio. He used studio effects as inventively as his electric guitar, amplifiers, and stompboxes. His music evoked a new timbral language and changed the way we experience music, including a fluidity to the motion of vibrations coming from the left and right speaker channels. This technology allowed him to sonically replicate the worlds that he imagined and leave behind a lasting record on the most advanced equipment available.

One may begin to look at Hendrix in a different way, as a master of technology or an Afrofuturist man-machine hybrid. As Tricia Rose tells Dery, "mastery over technology engenders a degree of awe, particularly in black folks whose access to

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[36] For more on Afrofuturism see: Kodwo Eshun *More Brilliant Than The Sun: Adventures in Sonic Fiction* (London: Quartet Books, 1999); Alondra Nelson, "Introduction: Future Texts," *Social Text,* no. 71 (Summer 2002): 1-15; Tricia Rose *Black Noise: Rap Music and Black Culture in Contemporary America* (Middletown: Wesleyan University Press, 1994); John Szwed *Space is the Place: The Life and Times of Sun Ra* (Cambridge: Da Capo Press, 1998); Alexander Weheliye "Feenin': Posthuman Voices in Contemporary Black Popular Music," *Social Text,* no. 71 (Summer 2002): 21-47; George Clinton, *Brothers Be Like, "George Ain't That Funkin' Kind of Hard on You?": A Memoir*, (New York: Atria Books, 2014). Music examples: Parliament, *Mothership Connection* (Casablanca, 1975); Outkast, *ATLiens* (LaFace, 1996) and *Aquemini* (LaFace/RCA, 1998); Janelle Monáe, The Electric Lady (Wondaland Arts Society/Bad Boy Records, 2013).

technology is limited."[37] Hip-hop's cultural takeover is the best modern example of a marginalized community gaining social power through the artistic appropriation of technology. Dery argues, "hip-hop culture retrofits, refunctions, and willfully misuses the technocommodities and science fictions generated by dominant culture."[38] The repurposing of technology to fashion a mythology can be witnessed in graffiti artist Rammellzee's android exoskeleton Gash/Olear. His bodysuit features strobe lights, flame-shooting nozzles and a portable Vocoder, echo chamber and sound system, called the Computator, controlled by a keyboard gun. In his introduction to *Flame Wars*, Dery claims, "we are being 'Borged'… transformed into cyborgian hybrids of technology and biology through our ever-more-frequent interactions with machines."[39] This idea of hybridity is clear in Rammellzee and other Afrofuturist musicians from Sun Ra to George Clinton, but it also extends to Hendrix and his special relationship to new electronic tools as fundamental to his musical expression as an extension of his body.

These guitars, effects and amplifiers comprised Hendrix's live and recording setup, but it was at the mixing board that Hendrix stretched the very limits of sonic expression. Waksman points to Hendrix's obsessive and inventive studio personality as overshadowed by his live reputation, "Hendrix in the studio was someone else, an almost insular figure who could lose himself in the seemingly endless sound possibilities

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[37] Dery, loc. 3676 of 6208.

[38] Dery, loc. 3222 of 6208.

[39] Dery, loc. 337 of 6208.

afforded by electric technology."[40] Hendrix was a pioneer in thinking of recorded sound as a material that could be reshaped. This idea has become commonplace since the invention of the sampler, as cultural studies scholar Nabeel Zuberi describes, "attention to the corporeality of music equipment and gadgets extends to thinking about the sound itself as material, particularly since the hip-hop era liberated the fragment in the form of the scratch, the break, and the sample."[41] Most musicians treated the recording as the finished product, however, Hendrix viewed the recording as an intermediary step. The sound itself needed to be effected, edited and shaped to articulate his sonic ambitions.

Hendrix grew obsessive over achieving the exact sound he desired, taking hours, if not days, on repeated takes and precise mixing until the music was just right. His level of perfectionism caused rifts with some of the longest-standing members of the Hendrix camp. Bassist Noel Redding complained about Hendrix's endless studio takes and preferred the more improvised and spontaneous style of the Experience in a live setting, often leaving the studio while Hendrix rerecorded Redding's bass parts himself. At the start of *Electric Ladyland*, manager and producer Chas Chandler broke off his professional relationship with Hendrix, citing the excessive recording sessions and party atmosphere of the studio. Hendrix, who actively participated in mixing his previous

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[40] Waksman, 169.

[41] Nabeel Zuberi, "Is This the Future?: Black Music and Technology Discourse," *Science Fiction Studies* 34, no.2 (Jul 2007): 283-300. Quote on 283.

albums, decided to take on the role of producer alongside engineer Eddie Kramer and Mayer.

The image of Hendrix wielding his guitar with an uncanny dexterity is familiar, but he was just as skilled sitting behind the mixing console with its countless knobs and faders blinking like the flight controls of a spaceship. Hendrix began testing the limits of stereo in a time when mono mixes reigned in popular music. His intuition that music could move, side to side, and even spin around the listener's head revolutionized the way we heard and felt the vibrations. Greg Tate addressed the lasting influence of Hendrix on recorded sound, "people think about Hendrix as just being an influence on guitar players, but he really changed the way that music sounded in general… anyone who is doing post-production on the sound of music, echo, reverb, flange, wah-wah, whatever, like anything that's between the instrument and the take, the file—Jimi Hendrix is up in your thing."[42] In this reading, Hendrix was as much a virtuoso of early stereo mixing as he was on the electric guitar. He sculpted alien soundscapes that transported his listeners to far-out galaxies, while still maintaining an aura of authenticity and musicianship that often eludes electronics-heavy music producers.

The Jimi Hendrix Experience's debut, *Are You Experienced*, mixed the blues with psychedelia. His tracks rocked with distortion-fueled energy, at other times, they grooved upward into the marvelously transcendent. The album was recorded in west London's Olympic Studios, where Hendrix first met engineer Eddie Kramer, who would become a

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[42] Goodison, 632.

lifelong partner in realizing Hendrix's sound with his technological studio know-how. Kramer immediately influenced the recording sessions by recording the rhythm parts on all four available tracks of the tape and then premixing the four tracks into a stereo mix. This technique, known as bouncing, freed up two tracks for overdubs and could be repeated a number of times to create dense stacks of sound that would be impossible to record with just one pass of a four-track. The method inspired Hendrix who desperately wanted to get over the limitations of recording machines to layer his arrangements. Sessions ran from late 1966 through April of 1967 and the album was given a final mix and pressed a month later.

Hendrix's UK record label, Track, released *Are You Experienced* in May of 1967. The US version followed in August of 1967, issued by Reprise Records, with a few significant changes. A new album cover replaced the more traditional photo of the band on the UK cover. The US version featured psychedelic purple lettering overlaid on a vibrant yellow background. This color scheme continued into the band photo, a fish-eyed circular image of the three members with exaggerated yellow and purple hues. The UK version customarily omitted the first three singles, "Hey Joe," "Purple Haze," and "The Wind Cries Mary." The US version included the three cuts at the expense of "Remember," "Can You See Me," and "Red House." The omissions of the R&B-styled "Remember" and the blues number, "Red House," gave the US version a more straight ahead rock flavor. The cut tracks harkened back to Hendrix's early career and a styles of music, blues and R&B, that carried a predominantly African-American audience. It

peaked in the top ten in both markets, reaching number two in England, behind *Sgt. Pepper's Lonely Hearts Club Band*, and number five in the US.

Hendrix captured the static of the air in the 1960s. Feedback was integral and intentional, sonically symbolizing frustration in "Manic Depression" and exasperated chaotic noise in "I Don't Live Today." The playing was breathtaking in its own right, but the sonic palette that Hendrix and his team created in the studio is the enduring legacy of the record. The experimental possibilities of the recording studio were already being explored by contemporaries as heard on The Beatles' *Revolver*.[43] Hendrix would elevate the studio techniques of reverb, echo, and especially panning. So much of the record's sonic magic relies Hendrix's obsession to make the music move, swirl and fly in stereo. Panning is controlled by moving the position on a knob on the mixing console to place the sound of an instrumental track at a position in the soundscape. Moving the knob all the way to the left or right corresponds with the audio moving toward the left or right speaker in the mix. Keeping the knob at 12 o'clock places the audio track in the middle of the stereo image between the two speakers. While most music panned a track to a set position in the soundscape and then left it alone, Hendrix, Chandler and Kramer continuously moved the audio back and forth between channels and around the stereo

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[43] *Revolver* (Parlophone, 1966) was the first album in which the Beatles used recording studio experiments as an integral part of the sound. They used the new automatic double tracking technique to double track vocals via tape recorders and varispeeding, backwards tape effects and various methods of sound filtering. The most far-out track, "Tomorrow Never Knows," became a psychedelic exploration including drones, tape looping, filtered vocals

image while mixing in real time. This technique amounts to a panning performance as a second pass after recording the basic instrumentation, giving the song a constantly shifting and surprising fluidity. They applied effects like echo, reverb and phase filters in post-production to further transform the sounds into a trippy, psychedelic wash of audio. Thus, Hendrix's tracks never sound still, there was a constant sense of motion and liveliness. *Are You Experienced* reimagined what music could sound like at the end of the '60s and beyond. The album was a watershed moment in rock music expressionism.

The possibilities of the recording studio allow Hendrix to present a surreal backing track for the album's title track. The song opens with an invitation to break from rational order, "If you can just get your mind together / then come across to me / We'll hold hands an' then we'll watch the sun rise from the bottom of the sea." As Tate intimated, the use of space or the deep sea are mirror images of the same Afrofuturist mythology. Hendrix takes the listener to a faraway land, breaking the limitations of earthly reality. He accomplishes this musically by reversing the tape and running the guitar, solo and drums backward. The rhythmic effect of the reversed drums served as a prototype for the DJ scratch and would be a future inspiration for hip-hop turntablists. Listeners are invited on a sonic journey to an alternate plane with Hendrix's question, "Are you experienced? / Ah! Have you ever been experienced?"

"The Wind Cries Mary" was first issued as a b-side on the Experience's second commercial single, "Purple Haze." It is a testament to how Hendrix can transform the story of an everyday fight between lovers into a mystical song of love lost. His cleaned

up guitar tone shimmers thanks to the Uni-Vibe's soft, warbling modulation.[44] His voice and guitar solo are hard-panned to the left channel giving the impression of a benevolent watcher from the sky commentating on the scenes of daily life. The track also features the drums panned to the opposite, right channel and the remaining guitars sitting into the middle of the stereo field. The mix is physically disorienting, allowing the listener to lose themselves, as if in the wind, while Hendrix's lyrical narrative unfolds into visual surrealism of changing colors.

A similar soundscape is used in "Love or Confusion," an introspective emotional journey in which Hendrix's mind drifts to the sky while pondering love. The lyrics open, "Is that the stars in the sky or is it raining far from now? / Will it burn me if I touch the sun, / so big, so round?" Themes of love and celestial transcendence are common in Hendrix's lyrical explorations, often in tandem with subverting physical laws of time and gravity. Hendrix's music swirls with this displacement using stereo sound to full advantage. Again, he pans his voice hard-left, only this time with significantly more reverb to add to the spacey ambience. Occasionally his voice will travel in echoes toward the right channel. The band stays steady in the middle of the mix, except for the lead guitar that weaves from left to right in waves of distortion and occasional feedback.

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[44] For swirling vibrato effects, Hendrix relied on the Univox Uni-Vibe. The Uni-Vibe mimicked the sound of the Leslie rotating speaker cabinet. The user can select between a Chorus or Vibrato effect to color the output. The Uni-Vibe achieves each effect through a series of phase filters controlled by sensors that react to a pulsing light bulb, thus the Uni-Vibe is actually more of a phaser than either of its two modes indicate. Other controls include volume and intensity of the effected signal.

Hendrix's forays into musical science fiction are evident on some of these early tracks, but it is the centerpiece of the spacey-jam, "Third Stone from the Sun." Hendrix described the tune with a nod to studio trickery in slowing down voice to add to the soundscape, "'Third Stone from the Sun,' it takes about seven minutes and it's an instrumental—these guys comin' from another planet…So we have all these different sounds, all of them made from just nothin' but a guitar, bass, and drums, and then our slowed-down voices."[45] The track opens with the slowed voices of Hendrix and Chandler, panned hard left and right, hovering above the Earth in spaceships and discussing landing for a closer look, "[Chandler] I am in orbit around the third planet of star known as sun, over. / [Hendrix] May this be Earth, over. / [Chandler] Positive, it is known to have some form of intelligent species, over. / [Hendrix] I think we should take a look." The song itself is a progressive rock and jazz fusion overdubbed with the whirling of space noise fading in and out and traveling side to side in the stereo image.

The spoken lyrics describe Earth from the alien observer's perspective. The first verse centers on the natural landscape, "Oh strange beautiful grass of green / with your majestic silken scenes / Your mysterious mountains / I wish to see closer." The words echo another patriotic anthem, "America The Beautiful," and speak to the counterculture's environmental consciousness. The narrator is positioned as an outside observer and Hendrix's voice is heavily echoed and panned hard left. He takes in the beauty of the planet and asks if he can "land my kinky machine." Hendrix imbues this

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[45] Klas Burling, "Interview with Jimi Hendrix," in Roby, *Hendrix on Hendrix*, 40.

alienness with a sexual power, in the way Waksman describes his mastery of the guitar as a "technophallus." The line evokes the space funk sexuality of later groups like Parliament-Funkadelic.

The sound of the revolving spaceships whistle from one side to the other as they come down for a landing. The second verse turns from the Earth's natural beauty to the social relations of its people. The narrator then pulls away from his desire to inhabit the Earth. The lyrics read, "Although your world wonders me / with your majestic superior cackling hen / Your people I do not understand / So to you I wish to put to an end." Hendrix's identity, both as African-American and an icon of the '60s counterculture, position him as a cultural outsider. He invokes patriotic songs, either the "Star-Spangled Banner" or "America The Beautiful," to make powerful social commentary that the reality of life in America is not the same as the idealism of its anthems. Although sometimes read as critical and unpatriotic, these do not seem to be Hendrix's sentiments, considering his description of the songs as beautiful and his desire to live, work, and be a successful American artist. His perceived social exclusion pushes Hendrix periodically to space, however, and in songs like "Third Stone of the Sun," he always seeks a return in hopes that the world has changed for the better.

Hendrix once said that "Imagination is the key to my lyrics. The rest is painted with a little science fiction."[46] Usually read as an LSD reference, Hendrix claimed that

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[46] Quoted in liner notes to Jimi Hendrix, *Jimi Hendrix: The Ultimate Experience* (MCA MCAD-10829, 1993).

"Purple Haze" was mostly inspired by science-fiction story, "Night of Light," by Philip José Farmer. In the story, a purple haze envelops a distant planet, once every seven years, that subverts reality and amplifies the good and bad natures of its inhabitants. They can choose medical assistance to sleep through the chaos or participate in the strange battles of good and evil that follow the violet light.[47] In the song, Hendrix subverts physics, time, color, and sonic orientation, making "Purple Haze" code for the psychedelic experience. The music is a reflection of the surreal swirl of psychedelic vision, only righting itself when Hendrix takes a pause to look upward, "'scuse me while I kiss the sky."

"Purple Haze" seems the perfect synopsis of the Jimi Hendrix Experience in roughly three minutes. It contained all of the elements of the band's style and a good sample of the technological wizardry that made the Experience sound so far out. The track was the first A-side single of original music and announced the band to a wider audience in the UK. It also led off the US version of *Are You Experienced*, becoming many people's first encounter with Hendrix and the psychedelic challenge posed in the purple lettering of the album cover.

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[47] Philip José Farmer, *Night of Light* (London: Orion, 2013).

The song opens with a Fuzz Face-soaked riff based on the tritone interval.[48] Hendrix displays his unorthodox chord fretting that allowed him to play both a rhythmic and melodic part simultaneously by using his thumb wrapped over the top of the neck to fret the bass note and his other fingers to produce short trills and slides. Hendrix's vocals are panned wide-right, reverbed with a slight echo. A ghostly whispering enters from the left channel, often intelligible except for the phrase "purple haze." When both voices overlap, the listener is sent into a dizzying tailspin, most noticeable as the the song descends into a panned wash of chaotic noise by the end. The solo features Mayer's Octavia producing the dramatic overtones characteristic of the octave-up effect.[49] It is an inventive, but painfully mechanical guitar wail that had no precedent in recorded music.[50]

Reflecting on this period, Mayer tells *Guitar Player*, "We talked about creating new soundscapes. Jimi was most interested in making new sounds for the records… He

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[48] When he needed even more distortion than his high-output Marshalls, Hendrix particularly favored the fuzz pedal. The sound is completely transformative of the guitar tone, adding a chaotic blend of static, sustain and thickness. By the mid-60s, Hendrix added the new Gibson Maestro Fuzz-Tone to his live guitar setup. The effect had been popularized by the Rolling Stones' 1965 hit "(I Can't Get No) Satisfaction," and quickly became in-demand for its fat distortion sound. Hendrix eventually settled on the Dallas Arbiter Fuzz Face as his main fuzz pedal, which he used for the duration of his career.

[49] The Octavia combines fuzz with octave doubling. It was developed specifically for Hendrix by electrical engineer Roger Mayer and housed in a unique triangular metal cheese-wedge chassis. It often produces a mechanical, detuned sound that mimics a ring modulator.

[50] All lyrics from liner notes to Jimi Hendrix, *Are You Experienced* (Experience Hendrix/ MCA MCAD-11602, 1997).

felt he needed to be on the cutting edge with new sounds."[51] Mayer worked alongside Hendrix in the studio, designing and modifying guitar effects on the fly, soldering circuit boards in an adjacent room, trying to stretch the possibilities of sound alongside Hendrix. Even with the level of innovation on his first LP, Hendrix remained creatively frustrated with the limitations of technology. In 1967, he complained to journalist Meatball Fulton about resistance from the record company to allow conceptual double-LPs and inconsistent mixes blamed on the the companies that cut the records for distribution. Hendrix grew increasingly frustrated about the limits of recording, "I want to have stereo where it goes… up—the sound goes up, and behind and underneath. But all you can get now is just across and across."[52] Stereo was still a new development for popular music, and Hendrix was already thinking of immersive sonic fields that stretch from stereo's 2 channels into the 5.1, 7.1 and even 22.2 channel configuration of modern high definition surround sound.

The Experience returned to London's Olympic Studios, with Chandler serving as producer and Kramer as engineer, to work on his second album, *Axis: Bold As Love*. This time both the US and European versions carried the same track listing and album cover. In spite of Hendrix's disapproval, the cover featured each band member's face painted into a Hindu religious poster, perhaps an effort by the record company to link Hendrix with the counterculture's fascination with Eastern spirituality. Track released

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[51] "Hendrix at 70," *Guitar Player* (May 2012), 53.

[52] Meatball Fulton, "Interview with Jimi Hendrix," in Roby, *Hendrix on Hendrix*, 79.

Axis: Bold As Love in December 1967, while the US Reprise edition came shortly after in February of 1968. It peaked in the top five of the charts in both markets and garnered both critical and commercial success for the band. *Axis* was released in both a stereo and mono mix. However, it would be the last Hendrix release to have a dedicated mono mix, as stereo aural movement seemed essential to the music by this point.

Again, Hendrix relied on cutting-edge electronic technology to transport himself and the listener into outer space. Zuberi posits a useful question, "How might the close listening to 'effects' in music change its study, particularly when we are dealing with digitally produced music that has become its own kind of 'science-fictional story'?"[53] This time around, Hendrix appeared more interested in songwriting and creating a sonic concept that would be difficult to recreate live, making the recorded media the definitive version of these songs. Like The Beatles, Hendrix began moving away from live performance and deeper into the sonic wonders of the recording studio. Only a couple of *Axis*' songs were played in live performances, meaning that the studio effects were essential to the track's conception and Hendrix refrained from playing them without the definitive sci-fi treatment of the recording.

When the needle drops on *Axis: Bold As Love*, the listener interrupts a transmission from Radio Station EXP between an announcer, voiced by Mitch Mitchell, and a Mr. Paul Corusoe, voiced by Jimi Hendrix. The voices in "EXP" are also manipulated through speeding the recording up and down to modulate the pitch and rate.

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[53] Zuberi, 284.

Mitch Mitchell's voice is sped up producing high-pitched squeaky tones, while Hendrix, as Mr. Corusoe, is sped down into a lower-pitched, cool drawl. The brief exchange revolves around the subject of "flying saucers or… ahem, UFO's." The announcer wants to debunk the myth of their existence, but Mr. Corusoe gives a sly answer, "you just can't believe everything you see and hear, can you. Now, if you will excuse me, I must be on my way." The announcer reacts in disbelief as Mr. Corusoe lifts into orbit represented through the motion of stereo panning.

Hendrix turns again to stereo soundscaping techniques on "EXP" to create a fantastical auditory world miles above the Earth. By creatively panning the sound between left and right channels within the stereo mix, the opening track revolves around the listener. The effect causes a sense of spatial disorientation where the music triggers the imagined sense of spinning. Hendrix uses the technique in this example to imagine the ascent of a spacecraft. Another significant electronic feature of "EXP" is Hendrix's use of feedback as a layer of ambient noise. The guitar distortion static and microphonic feedback stand-in for the UFO's imagined machinery.

"EXP" also provides the first instance of stereo phasing. Hendrix described the effect in imaginative terms, "it's called phasing. It makes it sound like planes going through your membranes and chromosomes… That's the sound we wanted, it was a special sound, and we didn't want to use tapes of airplanes, we wanted to have the music itself warped."[54] Phasing filters a sound by processing a series of peaks and valleys

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[54] Jay Ruby, "Interview with Jimi Hendrix," in Roby, *Hendrix on Hendrix*, 94.

within the frequency wave. The effect is audible when the phase-shifted audio, which has been run through all-pass filter stages, is mixed back with the original dry signal to produce an out-of-phase audio interference. Hendrix used a method of phasing that creates this spacey, out-of-phase effect through oscillators for both left and right channels, hence stereo phasing. The technique is also employed on the drum solo in "Bold As Love."[55]

The following track, "Up From The Skies," follows the pondering of a former Earth-dweller who has returned to the planet, "And I come back to find the stars misplaced / and the smell of a world that has burned." Returning to check-in on Earth remains a consistent theme of Hendrix's lyrical narratives. If we assume that he has lifted off into space at the end of *Are You Experienced*, then "EXP" serves as his descent back to the planet. "Up From the Skies" marks the surveying of the land and its people, "Well, maybe, maybe it's just a change of climate / I can dig it, I can dig it baby, I just want to see." Hendrix expresses a final curiosity about the changing world, rather than a criticism, "I want to know about the new Mother Earth / I want to see and hear everything." When he previously landed on "Third Stone From the Sun," the disarray of society forced him back into the skies. Perhaps by his second album, Hendrix felt as though the counterculture was changing the landscape. This time he offers a longer stay to see what is happening.

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[55] Heatley, 87.

"Up From The Skies" features Hendrix's first heavy use of the wah pedal on a recorded track.[56] The jazzy number bounces along on a funky wah-wah inflected rhythm guitar part. The wah remains kicked on for Hendrix's solo, which also spatially moves from left to right in the mix. His vocals carry a similar movement, often bouncing between speakers for a virtual call and response between lines, a common blues trope. As heard on *Are You Experienced*, the technique of panning is used to disorient the physicality of instruments and vocals within the mix, often in starkly offset placement.

On *Axis*, panning is approached with much more fluidity. Elements of the mix slowly shift between speakers and the effect takes on a greater illusion of movement. As Mayer describes:

> He and I talked about what hadn't been done, and one of the main things was panning the signal so as to move the sound around the mix while manipulating the echo to create different spatial awareness… if we panned the echo left to right while changing its EQ, suddenly the guitar could sound like a spaceship coming toward you. So using a combination of tape delay and EMT echo plates, and by manipulating the delay, the panning, and the EQ, we were able to make the music move and sound more three-dimensional.[57]

This three-dimensional panning effect occurs throughout the album in the rhythm of "Ain't No Telling," or the guitar solo in"You Got Me Floatin'" for example.

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[56] Hendrix's most characteristic effect was the wah pedal. The Thomas Organ Company designed the "Cry baby" wah in 1965 to give guitarists the sound of a horn mute. The wah creates its vocal sound by sweeping the peak of a filter over a frequency range controlled by the guitarist's foot rocking a potentiometer.

[57] "Hendrix at 70," 53.

"Up From The Skies" was paired as a seven-inch single with another science-fiction themed piece, "One Rainy Wish." It recalls a dream of lovers laying beneath a tree of song. Hendrix joins her on the ground to dream while looking into a sky full of psychedelic color. As the lovers gaze, fantastic images dance above them, "The sky was filled with a thousand stars / While the sun kissed the mountains blue / And eleven moons played across the rainbow above me and you." The song meanders between changing time signatures and Hendrix lends another jazz-inspired guitar performance with mid-position pickup tones into a more straight ahead rock chorus. The two tracks continue to link the mind-expansive drug culture with interstellar fascination.

Axis: Bold As Love also features some distortion-heavy mood pieces. "If 6 was 9," a reflection of the tension between the freak and straight world, drips with fuzz distortion. "Spanish Castle Magic" races along the frenetic, electrified energy of many of the first album's hits, making the track one of the few *Axis* tunes to also be a live set staple. It is a song about the a Seattle music club, Spanish Castle, where Hendrix often played in his early career. He uses the song to imagine flying back home, traveling by "dragonfly." The lyrics revolve around a daydream of returning, but the distorted mood indicates Hendrix's constant alienation. It reflects his sense of rootlessness, working in London and wrestling with a desire to move back to the United States, thematically similar to his brief returns to Earth from distant planets.

Some of Hendrix's other electronic tricks make an appearance as well. Backwards guitar features in "You Got Me Floatin'" and "Castles Made of Sand." While

"Little Miss Lover" makes use of two of Hendrix's favorite guitar stompboxes. He rocks his wah pedal while muting the guitar's strings for a filtered rhythmic texture, a technique later made famous in the beginning of "Voodoo Child (Slight Return)." Hendrix kicks on his Octavia for its signature fuzzed octave doubling sound on the track's solo section.

Overall, *Axis* is a much cleaner and subtle recording. The songs fall within the rock genre, but carry a significant influence from Hendrix's early R&B career in the sweetened tempos and jazzy chord voicings. A great example is the ballad "Little Wing," which demonstrates how much *Axis* was about sonic movement, while *Are You Experienced* relied so much on distorted energy and noise. The song speaks to an angelic female-figure, who floats above as a kind of spiritual protector. Hendrix locked his pickup selector in-between the neck and middle pickup, a nonstandard position, and ran the output into a Leslie rotating speaker cabinet. The result is a fluid, shimmering sound that remains one of his most legendary guitar tones. A glockenspiel lends a further ethereal quality to the track, though a strange instrumental choice for a rock band context.

The final track, "Bold As Love," is a meditation on color in a epic battle of emotion and mood. The final exclamation is that love is the most triumphant emotion, "Just ask the Axis, he knows everything." The album lifts back into space during Hendrix's transcendent final guitar solo, a masterwork of tasteful playing and creative soundscaping. Studio effects abound to sonically create the three-dimensional lift off. Hendrix's guitar is phased and Mitchell's drums are flanged, an effect produced by physically touching the tape of the playback machine. *Axis: Bold As Love* returns to the

far-out place, awaiting Hendrix's next return on his double-LP studio masterpiece, *Electric Ladyland*.[58]

After two successful records, Hendrix relocated from London to the United States in 1968 and began recording at New York's Record Plant. Kramer and Mayer both followed him to the States to serve as engineers and technical advisers on his next record. After Chandler grew frustrated and split from the group following disagreements over the atmosphere of the recording studio, Hendrix assumed the role of "producer and director." His final studio album, *Electric Ladyland*, was released in October 1968. Only a dedicated stereo mix of the record was produced and Hendrix made the most of his ability to move sounds within the stereo image. The record climbed to the top of the US chart, becoming Hendrix's only number one album.

An ominous thump of a floor tom opens the record followed by revolving static and unintelligible slowed voice running backward. Essentially a noise instrumental, "… And the Gods Made Love," builds in texture and intensity, demonstrating how adept Hendrix has become in the art of moving sound. Nearly all of the available studio tricks are harnessed to build the ambient music, including reverb, delay, tremolo, panning, fluctuating tape speed and flange. The cinematic opening heralds the return of the guitar icon back from another dimension.

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[58] All lyrics from liner notes to Jimi Hendrix, *Axis: Bold As Love* (Experience Hendrix/ MCA MCAD-11601, 1997).

It fades into the Uni-Vibe'd rhythm of "Have You Ever Been (To Electric Ladyland)." The guitar tracks weave around each other in syrupy legato passages as Hendrix sings about the wonder of electric love. He invokes flying imagery once again to describe the emotional journey, "So it's time we take a ride, we can cast all of your hang-ups over the seaside / While we fly right over the love-filled sea / Look up ahead, I see the loveland, soon you'll understand." By his third album, Hendrix increasingly moved toward tales of fantasy, whether space-themed, the bottom of the sea or varied surrealist dreamscapes to express a future that transcended the contemporary social unrest.

Sketches of otherworldliness exist in tracks like "Voodoo Chile." Hendrix proclaims, "The night I was born the moon turned a fire red." The braggadocio of the lyrics and the psychedelic take on the main riff are a clear homage to Hendrix's blues influences, primarily the Chicago style and Muddy Waters. However, Hendrix's boasts takes on an interstellar context, "He took me past to the outskirts of infinity / And when he brought me back / He gave me a Venus witch's ring." His blues power is supernatural, "Well my arrows are made of desire / From far away as Jupiter's sulphur mines." The space blues jam runs approximately fifteen minutes and enlists guest musicians Steve Winwood on organ and Jefferson Airplane's Jack Casady on bass.

Hendrix's lamentation on the gypsy wanderer's life comes through in the exotic "Burning of the Midnight Lamp." Harpsichord and wah-inflected guitar double one another in a beautiful pattern ending with a vibrato bar and wah flutter into the densely

layered music of the verses. Vocals are overlaid on two rhythm guitars, bass, effected drums, more harpsichord and a lush chorus of background vocals. The guitar solo, drenched in wah, twists and turns even more than most of Hendrix's panned sequences. The overall feeling of loneliness and alienation trouble the free spirit, as Hendrix's voice intimates, "Loneliness is such a drag." The outro cascades into a swirl of echoes and sonic noise.

Side Three of Electric Ladyland begins an imaginative trip into the realms of science fiction. "Rainy Day, Dream Away" shuffles in a groovy jam while the musicians float above the realities of the dreary rain into a state of altered consciousness. The music begins to fade while Hendrix encourages the listener to lay back and dream on a rainy day. The dream segues into one of Hendrix's most science-fiction themed songs, the deep sea odyssey of "1983… (A Merman I Should Turn To Be)." In this track, Hendrix seeks escapism from the sounds of war that he frequently criticized in his live performances, "I awake from yesterday, / alive but the war is here to stay / So my love, Catherina and me decide to take our last walk through the noise to the sea." Hendrix and his lover descend to the underwater utopia of Atlantis, "Our machine has done its work / Played its part well / Without a scratch on our bodies / And we bid it farewell / Starfish and giant foams / Greet us with a smile / Before our heads go under / We take a last look / At the killing noise / Of the out of style." The layered guitars shimmer with the watery tones of the Uni-Vibe and Hendrix's lyrics trail off in reverberated echoes. Again,

Hendrix offers a watery utopia on record as a contrast to the distorted noise of his live social commentary.

Approximately five minutes into the nearly fourteen minute sonic exploration, Mitchell's hi-hats begin to pan from side to side over electronically reproduced sounds of the sea. Hendrix's guitars reenter playing Eastern modalities straight ahead on the right channel, while the reversed solo floats between the two speakers. High-pitched feedback comes in from the left before the jam builds tremendous intensity for a heavily panned drum solo by Mitchell. The music quiets as instruments return one by one taking turns soloing over an ambient track of controlled guitar feedback. It builds until Hendrix takes a fuzzed blues solo into dissonance over Mitchell playing a march on the drums. The track ends with nearly a minute of feedback improvisation and heavy vibrato bar. The song is an astounding example of Hendrix's ability to conceive theatrical stereo mixes. "Moon, Turn The Tides… Gently, Gently Away" ends the side with the dramatic panning of static noise in wide circles around the listener's head. It is the classic aural association with the whirling spaceship ascending and lifting off, carrying Hendrix's fantastical deviation back to another world.

Side four returns the listener from space with a reprise of the blues shuffle jam, "Still Raining, Still Dreaming." Cutting through the spacey imaginations is a hard rocking suite of songs that reflect the cultural tension of the world outside his window. "House Burning Down," features the verse, "Try to learn instead of burn, hear what I say, yeah, yeah / So I finally rode away but I'll never forget that day / Because when I reached

the valley I looked way down cross the way / A giant boat from space landed with eerie grace / And came and taken all the dead away." The song ends with a distorted, echo of guitar that tears through the sound plane. It segues into the cutting bends that open Hendrix's transformation of Bob Dylan's "All Along The Watchtower." The song contains Dylan's cryptic lyrics, but Hendrix appropriated it in the end, imbuing it with the sort of chaotic electric power than remains the missing element in Dylan's own version.[59] The album ends with a return to the "Voodoo Chile" jam, this time referred to as "Voodoo Child (Slight Return)." Hendrix is backed by his Experience bandmates, Redding and Mitchell. The version opens with the most recognizable wah-wah guitar riff in history. It breaks into his fuzz distorted take on the Chicago-blues riff and Hendrix again signifying through blues braggadocio of supernatural proportions. The traditional style of the blues takes on a new technological context through Hendrix's electronic mediations. In both versions of the song, Waksman suggests that "Hendrix may indeed be asserting his blackness, but only if he can live it according to his own rules; and blackness therefore becomes a matter of individuality rather than a social condition."[60] Still, Hendrix realizes

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[59] The power of Hendrix's cover is not lost on Dylan, who subsequently performed the song in Hendrix's style and commented that he felt the song ultimately became Hendrix's.

[60] Waksman, 187.

his vision of transcending racial division may only be a future possibility, as he sings, "I won't see you no more in this world / I'll meet you in the next one / So don't be late."[61]

In an interview following the release of *Electric Ladyland*, journalist Tony Glover commented on the creative use of panning on the record, telling Hendrix, "The stereo thing is really nice. I've got earphones and it just flows right through your head." To which Hendrix replied, "Yeah, sometimes we'd, what you'd call, 'pan the echo,' and that's when you need 12-track. You can put the echo on a complete separate track of its own."[62] In the end, *Electric Ladyland* still did not live up to the sounds Hendrix heard in his head. He blamed the error on manufacturing, "We mixed it and produced it and all that mess, but when it came time for them to press it, quite naturally they screwed up, because they didn't know what we wanted. there's 3-D sound being used on there that you can't even appreciate because they didn't know how to cut it properly. They thought it was out of phase."[63] The three-dimensional effect caused by stereo panning and phasing would have been heard as a recording error to most audio technicians, but to Hendrix, it was the sound of the future, of pushing the stereo image beyond its limitations

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[61] Lyrics from transcription, *Electric Ladyland: Guitar Recorded Versions* (Milwaukee: Hal Leonard, 1989). Lyrics not included in liner notes to *Electric Ladyland* (Experience Hendrix/MCA MCAD-11600, 1997).

[62] Tony Glover, "A Jimi Hendrix Doubleheader," in Roby, *Hendrix on Hendrix*, 154. The discussion follows a few questions about recording the album at the Record Plant and utilizing its 12-track recording capabilities.

[63] Glover, 152-53.

to find music in another dimension. Engineer Eddie Kramer has subsequently restored the original, intended sound to later reissues of the record.

Hendrix's final project was building a recording space that afforded him the technology and time to develop his creative output. His obsession with booking exorbitant studio time became cost prohibitive as recording bills reached into the hundreds of thousands per year. Manager Michael Jeffery and Hendrix bought the Generation Club in New York's Greenwich Village and set about converting it into the first artist-owned recording studio. Electric Lady Studios was conceived as a space for Hendrix record at will and labor over mixes with the level of perfectionism that he desired.

The studio was designed by acoustic architect John Storyk with input from Kramer. The space was rounded, including round windows, at the behest of Hendrix.[64] It featured three state-of-the-art custom mixing consoles from the Datamix Corporation and a total of 32 channels for multi-track recording, a huge leap from the 4 track machines Hendrix used on his first two albums.[65] Ambient lighting changed color and a painted mural contributed mood elements to the creative space. Hendrix described the importance of atmosphere in the studio, "this is a different kind of studio… There are lots of cushions and pillows, thick carpets, and soft lights. You can have any kind of light

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[64] "History," Electric Lady Studio, accessed March 9, 2105, http://electricladystudios.com/history/.

[65] Heatley, 140.

combination you like… just what you feel like. I think this is very important… And we have the best equipment too."[66]

Artist Lance Jost's artwork reflected Hendrix's fascination with outer space in a hundred-foot long mural. The commission, "painted you into the interior of the Electric Lady Cosmic Craft with full views of you eminent relationship to eternity as you are hurtling through endless space—riding along the rainbow bridge to 'kiss the sky.'"[67] The art transforms the inside walls of the studio into a colorful spaceship. Its painted windows look out into the stars, while the view from the cockpit displays a rainbow bridge winding around the Earth in the distance.

The construction of the Electric Lady took considerably longer and cost more than anticipated with estimates exceeding a million dollars by the end.[68] Finished and opened in August of 1970, Hendrix scarcely used the recording studio before his unexpected passing. However, the studio remains a working and legendary recording studio used by generations of artists including The Rolling Stones, Led Zeppelin, U2, Stevie Wonder, Daft Punk and many more. It is fitting that Hendrix's final gift to Earth was an inspired place to imagine the future sounds of music.

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[66] Norman Jopling, "Man, Myth or Magic? Jimi Hendrix is Back, and Happy, and Talking" *Hendrix on Hendrix*, 290.

[67] "Jimi Hendrix Electric Lady Mural," Lance Jost Designs, accessed March 9, 2015, http://www.lancejostdesigns.com/electric-lady-studios/.

[68] Heatley, 139. Warner Brothers would provide a $300,000 loan in exchange for adding another record to Hendrix's contract deal.

Hendrix is remembered as a sort of charismatic misfit, someone who never really fit into a specific time or place, and therefore remains free of those constraints. Keeping Hendrix relevant, since his passing, has been a major concern of Experience Hendrix LLC, the holding entity that manages and licenses his intellectual property. It continues to release unearthed music and reissues to promote a cultural relevancy and timelessness to the idea of Hendrix. Therefore, it feels as if the audience still receives messages from Hendrix from time to time. Musicologist Paul Clarke explains that a recording facilitates the suspension of time, "the technology of audio or visual *recording*… both frees images and sounds (and therefore performances) from the limitations of place, *and*, by giving transient events a solid embodiment (on cassette, disc etc.), liberates them from the limitations of *time*."[69] Hendrix's commitment to the recording art and habit of rolling hours of tape allows for his artistic afterlife. These posthumous records carry nebulous titles such as *First Rays of the New Rising Sun* (1997), *South Saturn Delta* (1997), *Valleys of Neptune* (2010) and *People, Hell and Angels* (2013). As concepts of uploaded consciousness or post-body life emerge in our digitized culture, the contemporary cultural existence of Jimi Hendrix does not appear so far-fetched; almost as if he never died, but simply ascended to another plane.

A final thought by Hendrix's friend Roger Mayer remembers the human element that makes Hendrix's music so enduring, "all that stuff that was done with Jimi on all the

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[69] Paul Clarke, "'A Magic Science': Rock Music as a Recording Art," *Popular Music* 3 (1983): 195-213. Quote on p. 199.

records, even the stuff that was very distorted, it was very human sounding. The sounds take you out to space and they take you back, and you relate to it better."[70] Tragically, we can never know the sonic explorations that Hendrix would have realized in his Electric Lady Studios. However, it is important to remember the musicianship that cuts through the mystical aloofness of his psychedelic legacy. Hendrix contributed immensely to the history of electric guitar playing, but he was also a master and innovator of music technology. Through his mediation of electronics and music, he was able to create powerful social commentary that influenced the 1960s counterculture. Furthermore, through his carefully produced recordings, Hendrix advanced the sound of music while postulating an early Afrofuturist philosophy, advocating for the end of violence and ultimate transcendence of racial division toward a more utopian future society.

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[70] Dave Hunter, *Guitar Effects Pedals: The Practical Handbook* (San Francisco: Backbeat Book, 2004), 160.

CHAPTER FOUR - SURVIVALISM IN THE *PRETTY HATE MACHINE*: NINE INCH NAILS AND MULTITRACK MUSIC

"What I wanted to do was take a computer and give it integrity within the context of a rock band."[1] - Trent Reznor

"C'mon pigs, march!," Trent Reznor shouts to the audience before ripping into the carnal fury of "March of the Pigs," a particularly charged standout from Nine Inch Nails' *The Downward Spiral* (1994). The response is frenetic as the song carries the pit to its appropriate and accepted level of brutality for the rest of the show. The energy still feels primal twenty years later during the visually arresting "Tension" tour. Reznor remains on the vanguard of entertainment technology, but his music, largely produced by machines, never loses the vitality of the live communal human experience.

In the previous chapter, I illustrated how Hendrix used electronic soundscaping to create Afrofuturist-themed utopias in response to the violence and racial division within the United States during the 1960s. In this chapter, I argue that Trent Reznor's use of electronic sound, specifically computer-based production, announced a political rejection of Conservatism and information control in the early 1990s and 2000s. I illustrate how Reznor used digitized sound production to imagine dystopian futures as a consequence of

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[1] Jason Pettigrew, "Nine Inch Nails: No Pain, No Gain," *Circus Magazine,* Jan 31, 1993, http://www.theninhotline.net/archives/articles/nopain.shtml.

political control and invasion of civil liberties. Reznor expressed the angst of Generation X, a generational shift that opposed the perceived damage of Reaganomics. His embrace of the computer allowed him to wield the political critique of noise within industrial music through harsh digital distortion and mechanical rhythms. In doing so, Reznor exhibited an uncanny prescience, in line with Attali's theory, about the future of computer technology, digital culture and online life.

Industrial music highlights the volatile relationship between futuristic technology and a lost sense of connection to the physical world in a post-industrial communications era. The genre has consistently explored the margins of avant-garde anti-music and electronic instrumentation. Nine Inch Nails (NIN), an industrial band that achieved mainstream crossover in the 1990s, fuses rock, metal and electronic music, utilizing the processing power of computers as much, if not more, than acoustic instruments. The group is largely the work of Trent Reznor, founder and visionary of the band, who conceived of musical composition as a modern multimedia experience from the start. Reznor not only created texturally rich soundscapes through sound layering and synthesizers, but made early forays into the Internet, fan culture, art direction and societal critique through noise—all equally important facets of the Nine Inch Nails concept. As a gift to fans, Reznor has relinquished engineering control over some of his master tracks via nin.com and physical releases, so that fans may "remix" his music into their own creations and interact with others in an online community. This gesture reveals Reznor's important anticipation of sharing, streaming, tagging, and remixing at the personal level

and through social media. It demonstrates crucial principles of online free culture, including redistributing authorship and ownership, as well as participating in open-source platforms. Reznor may have also opened a path for a revolution in the methods of popular music analysis, as multitrack audio files offer an interactive alternative to the limitations of the musical score in the digital age.

This chapter will examine pivotal moments in the career of Reznor and NIN over the past twenty five years from his debut album *Pretty Hate Machine* through 2007's futuristic dystopian *Year Zero*. By applying Attali's principles that new technologies usher in new noises that prefigure a shift in society, Reznor's embrace of the computer as a digital instrument demonstrates a prescience about the value of online culture. Reznor became a cyberpunk hero for the next generation, arguing for the importance of information control, challenging political power, and populating online social space with an artistic and political vision. In doing so, he gave electronic music a serious artistic validity and introduced multitrack audio files to fans and composers, potentially moving music toward an interactive production model.

Electronic musical instruments were fully employed in mainstream pop music during the 1980s due to the commercial popularity of both pop music and hip-hop. The new, affordable consumer-grade synthesizer keyboards, centered around small microchip processors and functional preset patches, quickly became a novelty.[2] Synthesizers were

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[2] Import brands, such as Casio, Korg and Roland, produced relatively inexpensive analog and digital synthesizer keyboard and hardware.

formerly out of reach for most artists due to their prohibitive expense, their complicated patch programming, and because many, like the popular Minimoog, were not polyphonic instruments. Artists began to use the preset sounds of the familiar keyboard controller with a child-like wonder, chiming in the era's biggest dance hits or the delightful weirdness of new wave. The sounds of the digital machine were bright, anthemic and fun, wholly unthreatening and, in retrospect, more than a little tasteless.

In the electronic music of groups like Kraftwerk, the machines produced sounds with a mechanical and sterile absence of humanity. Although the qualities of artificiality and repetition are indeed part of the commentary in much of this music (or with Thomas Dolby, for example), the machine symbolized a totalitarian orderliness, and in NIN, it crossed over to the frightening. Reznor succeeded in coaxing an aggressive and menacing sound that had been difficult to pry from the cold, formulaic metal boxes, more akin to Hendrix wrangling a guitar's strings under heavy feedback. Mediated through the computer, he crafted the sounds of the new synthesizers into a dystopian monster, infusing the overwhelming fear of control into a futuristic soundtrack for the new millennium. Unlike the assembly-line efficiency of Kraftwerk or the consumerism of '80s pop, NIN's machines had become brooding and threatening.

As Reznor described in an early interview, "we're trying to use electronics and give them some merit… I think what we're doing is just as intense and as real as any so-

called ‘real’ rock band.”[3] In this statement, he recognizes that electronic instruments have continuously suffered from a stigma of artificiality when compared to their acoustic counterparts. Reznor also senses that synthesizers will ultimately sound dated and irrelevant if they are not treated as true instruments with an authentic, artistic integrity as related to the seriousness of the work and the depth of the art. His fierce protection of creative control and his foresight into the future of music technology helped establish the validity of computer-made music.

Reznor positioned himself as the cyberpunk hero attempting to wrestle the machine, literally and metaphorically. This would manifest itself in performances where Reznor frequently destroyed the electronics that he used in the show, throwing microphones, swinging weighted stands, toppling amplifiers, and stomping the keys off his keyboard with his black combat boots. He would physically break apart the machine, even through it was his instrument in a battle of control.[4] Both his rebellion against institutions of power and his noisy, destructive sonic palette aligned him with the hard-edged industrial genre.

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[3] Mike Gitter, “The Man Behind The Machine,” *Rock Beat*, May 1992, http://www.theninhotline.net/archives/articles/xart198.shtml.

[4] The smashing of guitars and other instruments is a common act of rock n’ roll rebellion. The destruction causes intense moments of noise and feedback that can be used as a disruptive sound with a level of social commentary. Two famous examples of guitar smashing include Hendrix’s finale at the Monterey Pop Festival and Pete Townshend, guitarist of The Who, during Woodstock.

Industrial music originated in England during the late-1970s as a response to conservative politics, the decay of factory-production capitalism and the failure of punk music to inspire a real social revolt. According to industrial music historian V. Vale, the term "industrial" referred to "the grim side of post-Industrial Revolution society—the repressed mythology, history, science, technology and psychopathology." Vale notes that as an art movement, "There is no strict unifying aesthetic, except that all things gross, atrocious, horrific, demented and unjust are examined with black-humor eyes."[5] The genre takes its name from Industrial Records, an independent record label started in 1976 by the band Throbbing Gristle. Friend and San Francisco-based artist Monte Cazazza came up with the label's tagline, "Industrial Music for Industrial People." The movement was a close connection of like-minded artists exploring transgressive culture and the potential of noise politics in various mediums, including visual art, performance art, music, and others. Jon Savage identifies five key ideas of industrial art as organizational autonomy, access to information, use of synthesizers and anti-music, extra-musical elements, and shock tactics.[6]

Sonically, industrial music is heavily distorted and unbearably loud. It is percussive and repetitive, often using electronic drum loops or sampled machinery to replicate the drudgery of the factory production model. It uses these disruptive timbres as

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[5] V.Vale, *RE/Search #6/7: Industrial Culture Handbook*, ed. V.Vale (San Francisco: RE/ Search Publications, 2006), 2.

[6] Jon Savage, "Introduction," in *V.Vale's RE/Search Issue #6/7*, 5.

a weapon against political propaganda. In a discussion of noise politics and the proto-punk band, the MC5, Steve Waksman argues that "The production of a disorderly electronic noise… indicated a contradictory stance toward technology, a willful move to master the tools of standardization which at the same moment threatened to drown out the human presence with the force of the machine."[7] This precise conflict is at the core of industrial music. It has allowed the music to be at the cutting-edge of technology and at the margins of a future-oriented society, while fearing the loss of one's humanity along the way. It exposes the power of the machine to desensitize and control its audience. Industrial music forcefully attempts to break listeners from a learned complacency. As Throbbing Gristle and Industrial Records founding member, Genesis P-Orridge recounts, "We're interested in information, we're not interested in music as such. And we believe that the whole battlefield, if there is one in the human situation, is about information."[8]

Stylistically, the industrial genre juxtaposes the leftovers of mass production—scraps of metal, magnetic tape, the sounds of a dial-up modem—with sadistically carnal images of excrement, sex, and raw meat. The music often takes place in an apocalyptic future where a totalitarian elite dominates mass forms of communication. The populace has devolved to the level of herded cattle, except for the enlightened few that wage a rebellious war against the ministers of information. It is the world of science fiction

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[7] Steve Waksman, *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience* (Cambridge, MA: Harvard University Press, 1999), 216.

[8] V.Vale, 9.

dystopias or popular films, like *The Matrix* (1999), where the hero is a cyberpunk, at once a master of the machine, but still human. In an illuminating comparison of cyberpunk literature and industrial music, Karen Collins summarizes a common plot between the two genres: "the socio-economic system of the West will lead to an *apocalypse*. The apocalypse will lead to, or be caused by, a *totalitarian elite controlling* the masses through *technology*, which brings about a need for a *resistance*, usually led by an *outsider-hero*."[9] Reznor, as an industrial musician concerned with dystopian themes, will crossover from the fringe genre as precisely this sort of outsider/cyberpunk hero for Generation X.

Existing as both social commentary and a musical genre, industrial shuns mainstream popularity as an ethos that is wary of becoming just another part of Western culture's rampant consumerism. The music is so abrasive, anti-commercial, and intentionally off-putting, that it almost defies fans to enjoy it. Thus, the popularity and economic success of an industrial-based band, like Nine Inch Nails, is not easily rectified within the genre's ethos. NIN became industrial's most commercially successful band, which could actually be enough of an argument to exile Reznor from the genre entirely.[10]

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[9] Karen Collins, "Dead Channel Surfing: The Commonalities Between Cyberpunk Literature and Industrial Music," *Popular Music* 24, no.2 (May 2005): 171.

[10] Reznor seems to begrudgingly allow journalists to label NIN as industrial in its early days. Although he acknowledges that the label has been given by critics and not himself. NIN, in his estimation, has certainly used the industrial palette, but is much different than most "industrial" bands in terms of its song structure, pop sensibilities and thematic concerns.

However, NIN is rooted in stylistic elements that are thoroughly industrial, though mixed with enough rock aggression, dystopian criticism and danceable electronic beats to cross over.

The genre was a starting point for Reznor, who cited early inspiration from industrial bands like Skinny Puppy. Besides his pop sensibilities, Reznor also differed from many industrial bands in his embrace of the computer to create music. As he told *Spin*, "I always like stuff that was computer-based, where you can tie the technology with music. It was a fresh new thing that couldn't have happened before."[11] Industrial bands were appropriating leftover technology of the industrial period, yet Reznor's interest in the computer is more indicative of a techno-futurist perspective. He theorized about the unintended consequences of information technology in the next era, rather than the damage done by an industrialized past. The realization that the computer could be a wholly new instrument, including capabilities for constructing unique soundscapes, aligns Reznor's curiosity with Attali's principle of musical prescience. The computer and online culture, both at the core of the NIN concept, has caused a fundamental reordering of human life.

Trent Reznor grew up in rural Mercer, Pennsylvania and was all too familiar with the economic downturn experienced in the post-industrial Midwest. Unemployment was a common problem for the local workers who lost their jobs when factories began to relocate. Industry never returned, but big-box retailers moved in, subsequently shutting

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[11] Jim Greer, "Nine Inches of Love," *Spin*, March 1992, 40.

town the family small businesses that made up Mercer's quaint downtown. Reznor would remember the wasting away of his hometown in later interviews, commenting that it was left to rust by the government in partnership with the new globalized market.

Reznor was a child of divorced parents from a very young age. He and his sister were raised by his maternal grandparents when the burden became too much for his single mother. His grandmother arranged for piano lessons and Reznor proved to be a sort of prodigy, even considering leaving school to pursue intense piano training for a future in classical performance. He ultimately decided to forego this path due to a preference for composition over the strictures of classical performance, and a growing interest in computer programming.

He would pursue computer engineering in college, but dropped out and began playing keyboards in local bands around the Cleveland music scene within a few months. He cited boredom and frustration in the classroom as motivation for the decision. His abandonment of both classical piano training and formal computer instruction demonstrate Reznor's fierce independent streak. He always maintained a desire for complete control over his pursuits and preferred to work countless hours in isolation to develop a personal knowledge and aptitude within his interests. After years of dissatisfaction with the band dynamic and the local music scene, Reznor began the NIN concept in the late 1980s as a self-contained entity where he remained the only member and creative voice. He started working odd jobs, like cleaning toilets, at The Right Track music studio in Cleveland in exchange for access to the studio during off hours. It was

menial work for the cyberpunk who toiled away nights in dedication to his artistic endeavor. He would eventually begin working as an assistant studio engineer, which afforded him the opportunity to learn MIDI programming and music production skills that he would put into practice for his own musical pursuits. The end result of his night sessions was the demo album *Purest Feeling*, which he began sending out to various record labels in hopes of securing a deal. NIN signed to small independent label TVT Records and Reznor set to work transforming his demos into NIN's debut album.

The band's commentary reacted directly to its unique context, the decline of the Rust Belt, the rampant consumer culture of Reaganomics and Yuppies, and the onset of a communications technology revolution. Raised Lutheran, Reznor also took aim at dogmatic religion as hypocritical and controlling, although he asserted a belief in God. He expressed an extreme anger over the failed promises of both government and religion in his introspective lyrics. These particular anxieties all exist on NIN's first hit song, "Head Like A Hole," in which Reznor warns of worshipping "God Money," and screams, "I'd rather die than give you control."[12] His penchant for dark moods, horror movies, computers, and electronic music placed Reznor beyond the margins and he began lashing out at mainstream society. Explaining his motivation to *Rolling Stone*, "I don't know why I want to do these things… other than my desire to escape from Small Town, U.S.A.,

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[12] Nine Inch Nails, "Head Like A Hole," *Pretty Hate Machine*, TVT Records TVT 2610-2, 1989.

to dismiss the boundaries, to explore."[13] For a band that is largely the personal vision and dark rumination of Reznor, NIN has been able to attract a large fan base since the 1980s by connecting those who feel similarly alienated by mainstream American culture.

Pretty Hate Machine, released in October of 1989 by TVT Records, was Reznor's first full-length studio album as Nine Inch Nails. *Spin* described the debut as, "a collection of dense electronic noise, synthesized beats and powerful laments that wallow in introspection, attack with violent screams and haunt with seductive, droning whispers."[14] A review by *Thrasher Magazine* noted that the album offered, "a variegated range of emotion, a human element that distinguishes Nine Inch Nails from its industrial/ electronic peers." Reznor agreed, telling the interviewer, "I didn't want to come across as an industrial, snarling, Satan-singing entity. That's not what Nine Inch Nails is. I try to juxtapose some sort of life or sincerity onto a tougher musical edge that normally wouldn't fit together."[15] Reznor had successfully transformed *Purest Feeling* into a darker, edgy soundscape, but maintained the humanity absent in most industrial music.

The record centered around heavy synthesized bass, keyboard chordal textures and programmed drum loops. Reznor had built rhythms from sampling drums with an E-mu Emax, a low-end sampler that stored 8-bit digital files on 3 1/2" floppy disks. The style was reminiscent of hip-hop production brought over to a rock context. The first

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[13] Jonathan Gold, "Love It To Death," *Rolling Stone*, Sept 8, 1994, 53.

[14] Robin Reinhardt, "Black Celebration/Flash," *Spin*, Feb 1990, 11.

[15] Steve Martin, "Nine Inch Nails," *Thrasher*, June 1990, 81-82.

single, "Down In It," was actually Reznor's attempt at hip-hop, combining a heavy dance beat with rapped lyrics. As Reznor had rudimentary skills on the guitar, he used guitars as energetic bursts of noise, heavily distorted and densely layered. MIDI and audio sequencing was done through a Macintosh Plus computer. The approach was on the cutting edge of computer-based music programming from the upstart musician, whose nightmarish soundscape was coupled with intimate lyrics that revealed the innermost thoughts of an intensely private person. The combination was jarring, but won over fans and critics with its innovative sounds and candid words.

A look over the album jacket helps to decipher the influences that shaped Reznor's early vision. Even though the original idea was to work solely with British record producer Flood, a number of different producers were brought in on different tracks and Reznor was left to make them fit together as a cohesive whole.[16] Reznor's credits thank a diverse group of artists for "Ideas and sounds (with all due respect)," many of whom are sampled throughout the album. These include industrial bands This Mortal Coil and Success, fellow alternative band Jane's Addiction, English author, director and artist Clive Barker, best known for the horror film *Hellraiser* (1987), and politically outspoken hip-hop crew Public Enemy. Perhaps the most bizarre inclusion in his list is the mega-popstar Prince. Prince's songwriting, band-leading, multi-instrument virtuosity and focused artistic vision are echoed in Reznor's approach to NIN. Also,

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[16] Adrian Sherwood, Keith LeBlanc, and John Fryer also produced on the debut album in addition to Flood.

Reznor's earlier experience playing synth keyboards in pop cover bands certainly contributed dance beats and catchy hooks into the dark ambience of NIN, another way in which Prince's influence crept into the early NIN sound, along with a sample of Prince's "Alphabet St."[17] Reznor had a knack for pop structure even as he brutally deconstructed it.

The band's imagery was very important to Reznor from the beginning of the project suggesting that NIN was conceived as a multimedia platform, rather than just a musical entity. Gary Talpas served as NIN's art director until 1997, co-designing the signature logo and associated artwork.[18] The NIN logo features the letters NIN, with the last N being reversed, within a rectangular box.[19] It is minimalistic and mysterious, a captivating branding that begs the viewer to ponder its meaning. The reversing of the letter "N" would be a signature of the art direction, serving as a subversion of the rules of written language.

Talpas would also design the album cover, which features a hot pink and blue distorted photo of a turbine surrounded by a stark black border. The blades are stretched

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[17] Prince's "Alphabet St." from *Lovesexy* (Paisley Park/Warner Bros, 1988) is sampled in the NIN track "Ringfinger."

[18] After 1997, Rob Sheridan would take over the art direction of NIN. He serves as webmaster, live video effects and producer of other NIN visuals. NIN would take on many elements of his aesthetic style, including VHS-based, analog glitch art. Sheridan also became a member of Reznor side project, How to destroy angels_, and often manipulates video effects during live performances.

[19] The Nine Inch Nails graphic logo can be viewed at: "the official nine inch nails website," Nine Inch Nails, accessed March 9, 2015, http://www.nin.com.

to resemble a ribcage, blurring the lines between machine and man. The lowercase text, "nine inch nails," runs along the top black border in white font with the n's reversed. A second strip of black cuts through the top third of the photo with the album's title, "pretty hate machine," in white contrast in the same font. Reznor developed his own cataloguing system for releases. The first single, "Down In It," was assigned Halo 1, and *Pretty Hate Machine* was designated Halo 2. The numbering system by release would continue through the present and add to the mystique surrounding the NIN concept.

The album's opening track, "Head Like A Hole," became a hit single despite its overt criticism of market-driven economics. Reznor equates God Money, a deified capitalistic enemy, with political power. While the majority have succumbed to the will of God Money, Reznor, as the objecting narrator, screams out, "I'd rather die than give you control." The song became an anthem for a "lost" generation facing economic uncertainty in the wake of Reaganomics, all while sensing the pressure of a marketplace saturated with consumer goods and aggressive advertising. The song defined the identity of industrial cyberpunk culture and remains one of NIN's most popular tracks. With lines such as, "God Money I'll do anything for you / God Money just tell me what you want me to," the song's verses speak to a subservient mentality toward the power of money. The chorus screams, "Head like a hole / Black as your soul," presumably the state of society that have given away their humanity to God Money. Reznor's rebellion comes in the last line, "I'd rather die than give you control," announcing that he will not buy into the herd mentality. It is immediately followed by a second chorus addressing the listener:

"Bow down before the one you serve / You're going to get what you deserve."[20] From the first track of the album, Reznor asks the listener to choose between his rebellion or following the mainstream in their worship of the false-idol, God Money.

Musically, "Head Like A Hole" juxtaposes electronically programmed tribal rhythms with synthesized bass in the verses. The first chorus is accompanied with a blast of heavily-distorted, layered guitar and drums. It is the most conventional guitar rock sound on the entire record. The second chorus features the same electronic-based instrumentation of the verses, but adds a vocal chant into the soundscape. The shift in dynamics between a soft verse and a loud, aggressive chorus would become a mainstay of alternative rock, particularly in the grunge, later sanctified, act Nirvana. Most of the album features Reznor's blend of danceable pop-structures and industrial timbres. "Head Like A Hole," a quickly-penned late addition to the album, differs slightly from the remainder of the record, which had been meticulously programmed in demo versions. The single's immediacy and explosive first chorus made the song more accessible to casual fans that were used to a more traditional rock sound.

Created in the MTV era, *Pretty Hate Machine* also featured a video campaign that added another artistic layer to Reznor's NIN ecosystem. The video for NIN's first single, "Down In It," features Reznor on the run, darting through a parking garage and climbing fire escapes. These images are intercut with surveillance video, close-ups, the NIN logo

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[20] Nine Inch Nails, "Head Like A Hole," *Pretty Hate Machine*, TVT Records TVT 2610-2, 1989.

and other visual elements. The technique of jarring visual juxtapositions are a hallmark of the industrial style, taken from the cut-up poetry technique of William S. Burroughs, a major influence on the industrial aesthetic. The video ends with Reznor's dead body on the street below, presumably after falling from the roof of a nearby building, but MTV refused to air it unless the ending was edited out. Reznor pointed to the absurdity of its censorship, "Our video was edited because I'm lying dead at the end of it. I can see that on a soap opera in the middle of the day… I'm just lying on the ground. That implies suicide, and we can't have that on MTV… but we can have Cher's naked ass."[21] Further controversy surrounded the video when a Super-8 camera affixed to weather balloons and used in the filming of Reznor's death scene broke loose and traveled over a hundred miles into a corn field, where it was discovered by a farmer and handed over to authorities. The footage of Reznor's body on the concrete caused police to believe the video was an underground gang or cult related killing. The FBI investigated the would-be murder for a year until a phoned-in tip from a student alerted them to the identity of the victim as NIN frontman, Trent Reznor. In the end, the case was put to rest and Reznor found the whole police investigation rather silly, for which he was lambasted by the host of the television show *Hard Copy* during a feature on the bizarre turn of events.[22] The criminal investigation and censorship fiasco surrounding the video proved Reznor's

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[21] "Getting Down In It," *Alternative Press*, Mar 1990, http://www.theninhotline.net/archives/articles/getdowninit.shtml.

[22] "NIN "Down In It" report" on "Hard Copy," Vimeo video, from Hard Copy televised on March 3, 1991, posted by "Nine Inch Nails," https://vimeo.com/17037838.

art was somehow dangerous to the established order. He was already stepping out of bounds, something he had intended from the beginning of the project.

The video for "Head Like A Hole" was less objectionable and thus received abundant airplay on MTV. It featured three distinct sections corresponding with the three major structure points of the song: verse, chorus and alternate chorus. Rapid cuts between black and white video of tribal dancing and a rotating, computer-generated cybernetic head strobe during the verses, echoing the musical juxtaposition of a primal rhythm and a synthesized bass line. At the chorus, the scene changes to NIN performing within a metal cage littered with magnetic tape. Here, the live band appears to burst through the refuse of recording technology. The destruction of the production equipment will carry over into their stage show where instruments become the unfortunate victims of the band's anger. The second chorus is a repeating loop of Reznor kneeling and dipping his head into a bucket of water and quickly pulling back, flinging his dreadlocks and cascading water backward in a baptismal scene. This footage is the negative reversal of black and white film and intercut with various words and missing reel images, intriguing the viewer to ponder what they are not seeing. As the video ends, we return to the large cage in which NIN is performing. The magnetic tape begins to wrap around and engulf Reznor like a net, eventually pulling him from the microphone and drawing him up toward the ceiling.

The song and video resonate with many of Attali's points. The tribal rhythms represent Attali's original "Ritual" stage of music, while the cybernetic head symbolizes

the online future, the next phase of society. Reznor is caught between the two, trapped, as he was by the magnetic tape, within the repeating culture of consumerism, which Attali ascribed to the stage when music became a product in endless repetition in the market. The chorus of "Head Like A Hole" attempts to use the politics of noise, in this case blasts of guitar distortion and screamed vocals, to break the perpetual loop between the ritual and commodified phase. His societal disruption comes in the form of the computer, which he will increasingly use to record and process his sound in production. As Collins points out, "Technology in cyberpunk has several related themes: it is representative of power, used as a symbol of alienation, and exposes a growing dehumanization through 'technocolonization' of the body."[23] Reznor's embrace and fear of the new technology echo all three of these themes and they will begin to inform the NIN concept moving forward.

Reznor became a cyberpunk hero for a new group of young people, Generation X, and specifically the musical subculture of the "Alternative Nation." Alternative functioned as blanket term, used by the industry, for music that did fit stylistically into a specific genre, usually combining influences from punk, funk, metal, folk, electronic, and rock into a hybrid style that varied across groups and regions. Perhaps the only common thread was its antagonistic reaction to the mass market pop that defined the 1980s and its global superstars like Madonna, Springsteen, and Michael Jackson. Alternative started as a counterculture, running parallel to the mainstream, with Seattle's grunge rock coming to

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[23] Collins, 172.

define the genre with its heavy rock sound and distortion. A darker undercurrent to the alternative nation is noticeable in bands like Nirvana and Nine Inch Nails. While alternative literally voiced an opposition to the commodified product of pop music, it quickly gained mass market popularity in spite of itself, sometimes difficult for its breakout stars to handle, as in the case of Kurt Cobain. What was initially heard as distorted, abrasive noise rapidly became the current trend.

Reznor provided a more melodic and accessible version of industrial music that managed to slip into the "anything goes" spirit of '90s' alternative rock. *Pretty Hate Machine* arrived at the right historical moment, capitalizing on the growing generation gap between baby boomers and young Gen X'ers. According to Attali's principles, a shift in generation would likely be signaled by a change in the sound of music defining a new culture. They were the first generation that did not see the opportunities and future achievements of their baby boomer parents. Instead, Gen X faced a rapidly corporatizing and globalizing America, but a steady rate of unemployment despite high levels of personal education. They appeared disaffected with their government and the Reagan '80s that hid social dilemmas below a gloss of rampant patriotism and cutthroat economic policies skewed toward business. The alternative nation represented a changing cultural landscape—one that would return to the culture of coffeeshops, dress in flannel, and begin a virtual life "online."

The live showcase for alternative music's arrival was the touring summer festival Lollapalooza.[24] The show highlighted the wide array of musical styles that fell under the amorphous "alternative" label, which meant Nine Inch Nails shared a bill with Living Colour, Butthole Surfers, Ice-T and tour founders Jane's Addiction, among others. The tour was much more than just a musical event, including political and environmental information booths concerning racism, police brutality, censorship, the Gulf War, voter registration, and activist organizations on abortion rights, AIDS awareness, gay rights, handgun control, Greenpeace and PETA. The eclectic roster was a welcomed challenge for Reznor, who intimated early on that he would rather tour with aesthetically different bands and be forced into winning over their audience. NIN was a standout of the festival, and this large-audience exposure greatly helped their mainstream crossover.[25] The alignment with Lollapalooza's musical and political message made Reznor a figurehead for an angered generation that thought differently about the direction of the country.

Early on, NIN's live performance was a chaotic blend of frustration and destruction. The band members hired by Reznor had a distinctive techno-Goth look, dressing in black latex, leather, combat boots, and fishnets. They coated themselves with cornstarch, creating a ghastly powdered effect that would thicken and crust when mixed

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[24] Lollapalooza was conceived by Jane's Addiction lead singer, Perry Farrell and held its debut festival in 1991.

[25] NIN has been a notorious festival band, often times stealing the show, including much praised performances at Lollapalooza 1991 and Woodstock 1994. NIN continue to play festivals and recently headlined Lollapalooza 2014.

with the performer's sweat. From his microphone and keyboards, Reznor antagonized all those around him—band members, roadies, the audience. He recounted, "Our show got much more anger-oriented, or just fucking frustration-oriented rather than 'we really want to do a fine job for everyone out there. Fuck you, like our music or we're going to fucking spit beer on you and insult you.'"[26] His hair gnarled into long black dreadlocks and dramatically shaved on each side, Reznor took on everyone to provoke a reaction.

NIN live were described as "genuinely frightening. They scared the shit out of the suits and pony-tails at last year's New Music Seminar in New York… And 12 months later, watching them from the side of the stage during the Boston shows of the Lollapalooza tour, I can't remember when I last felt so terror-stricken."[27] Another concert reviewer remarked that, "Nine Inch Nails have grown into a truly terrifying live act… Guitars smashing, keyboards slamming hard on the ground, and band members getting hurt… Real sweat and blood rock n' roll from a synthesizer-based band. There's nothing like the real thing."[28] The keyboards, loops and samples translated in a way that often eluded electronic-based bands. Reznor brought a rock n' roll danger to the electronic instrumentation. *Spin* proclaimed that "With their genuinely unhinged rock n' roll futurism, NIN blew away every other act in the festival, including headliners Jane's

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[26] Stacey Sanner, "Portrait of a Nine Inch Nail," *Alternative Press*, July 1990, http://www.theninhotline.net/archives/articles/portrait.shtml.

[27] "And A Bang of the Gear," *Hot Metal Magazine*, Sept 7, 1991, http://www.theninhotline.net/archives/articles/xart50.shtml.

[28] Gitter.

Addiction."[29] The strength of their Lollapalooza run resulted in critical acceptance, platinum sales figures, and unlikely commercial success. As *Alternative Press* noted, "the music of this one-man studio project, Nine Inch Nails has rapidly captured the attention of more than your usual adolescent synthesizer fanatic."[30]

Interviewer Jim Greer sought out Reznor, who had just moved to New Orleans, "looking for the hidden motor that drives the phenomenon of industrial music, which, however loosely (and inappropriately) defined, is currently threatening heavy metal and rap for musical dominance—and cultural relevance—in suburban neighborhoods across the country."[31] While his album sold particularly well through the Midwest, Reznor's gloomy lyrics and brooding personality echoed the tone of Seattle's grunge musicians and the darker apathy of Generation X in general. His music provided a futuristic, dystopian soundtrack for the new internet age. In the historically musical New Orleans, Reznor was set to continue pushing the boundaries of his newfound popularity.

His next video, "Sin," was banned from MTV due to graphic fetish themes, homosexuality and pierced genitalia. A wholly anti-commercial gesture from an artist whose last single, "Head Like A Hole," had benefitted greatly from MTV airplay. Reznor made challenging censorship authorities, as well as the music television monopoly, a central priority of NIN. He would continue making videos and explored releasing short-

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[29] Greer, 40.

[30] "Getting Down In It."

[31] Greer, 38.

film VHS compilations for purchase, rather than rely on cable television promotion. Eventually, Reznor began posting uncensored videos for download from nin.com, an early foray into online content distribution direct to fans.

Reznor began a public clash with TVT Records following the success of *Pretty Hate Machine* over Steve Gottlieb's refusal to release him from his contract. It would be the first indication of Reznor's aggressive attitude toward record labels and any attempts of control or authority put upon his creativity. The label initially thought it had signed a synth-pop band. However, upon the delivery of the *Pretty Hate Machine* master tapes, it was clear that pop was not the direction of NIN. When *Pretty Hate Machine* became an unlikely hit, the label pushed Reznor to simply reproduce the sound of the first record and began guiding him toward certain producers and other collaborators. Reznor, meanwhile, was insistent on moving his vision toward a darker, even more brutal edge. His next release, the *Broken EP*, would be recorded in secret to avoid any interference from TVT, and Reznor subsequently entered a legal battle with his label to secure his release.

After a nearly two years of proceedings, Jimmy Iovine's Interscope label absorbed TVT as part of a settlement. It was the only way that Iovine could ensure bringing NIN to Interscope. As part of the deal that was struck, Reznor was given his own subsidiary label, which he named Nothing Records, assuring that he would maintain sole artistic control over his future work and any artists signed to Nothing, including the goth shock-

rocker Marilyn Manson. Reznor left a special message for Gottlieb in the *Broken* credits, "no thanks: you know who you fucking are."[32]

The new songs resulted in a much more aggressive and guitar-driven record, deviating from *Pretty Hate Machine*'s reliance on drum machines and keyboards. Although Reznor started from the mentality of a traditional rock band lineup—vocals, guitars, and drums—the sounds were transformed. "We just took the three instruments and sampled 'em, fucked with 'em, processed them. It's kind of overboard, we did go crazy."[33] He feared that if he just presented a guitar-rock record, people would think of NIN merely as one of many loud, garage bands. Instead, Reznor had to translate that type of forcefulness into his unique computerized sound.

Asked about his turn away from electronics, Reznor replied, "I just got different equipment for one thing, and what appears to be guitar, bass and drums is really just a computer."[34] Reznor went out making field recordings on a portable DAT and brought them into a computer workstation as samples. He also used the computer to craft a layered guitar texture that amounted to a dense, radical timbre, "Almost every guitar sound on that record was me playing through an old Zoom pedal, direct, and then going into Turbosynth. Then I used a couple of key ingredients to make it sound unlike any real

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[32] Liner notes to Nine Inch Nails, *Broken*, Nothing/TVT/Interscope 7 92213-2, 1992.

[33] Lorraine Ali, "Ego is a Too Much Thing," *Alternative Press*, Jan 1993, http://www.theninhotline.net/archives/articles/xart23a.shtml

[34] Bob Gourley, "Trent Reznor interviewed during the making of the Nine Inch Nails album, 'The Downward Spiral,'" *Chaos Control Digizine*, 1992, http://www.chaoscontrol.com/nine-inch-nails-1992-exclusive-interview/.

sound in the world, layered about four of them together. By then, it wasn't a guitar anymore. It's an awesome sound."[35] Reznor would later detail some of the process to *Guitar Player* magazine, which included rerecording the digitally stored waveforms and running them through an oscillator to add bizarre frequencies and harmonics.[36]

A press sheet accompanied the 12" *Broken* promo's release that highlighted the subversive recording of the album, "Broken was secretly recorded from march to august 1992 in a variety of locations / without the permission of / the record label / to ensure it could fester without Divine intervention / now They just leave me alone and let me do what I want." Reznor goes on to announce that the record indicates a third phase of NIN, which he calls "the becoming," which will develop into a telling track on his next record *The Downward Spiral*. He reminds the reader that, "nine inch nails is still not a real band with real people playing real instruments."[37] The sentence indicates that Reznor was keenly avoiding classification as a rock band and intended to keep NIN an artistic concept with a mission.

Reznor continued to push the boundaries of music videos with the extremely grotesque, "Happiness in Slavery." The song had been written in response to his legal

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[35] Greg Rule, "Trent Reznor/Nine Inch Nails," *Keyboard Magazine*, March 1994, 88. Reznor is specifically referring to the Zoom 9030 for amplifier simulation and Digidesign's Turbosynth software.

[36] "Rusty Nails," *Guitar Player*, April 1994, http://www.theninhotline.net/archives/articles/guitar1.shtml.

[37] Nine Inch Nails, "Broken Promo Sheet," archived at nincollector.com, 1992, http://www.nincollector.com/archive/images/releases/halo_05/broken_uk12promo_presssheet_lq.jpg.

battle with TVT while recording *Broken*. He told *Billboard*, "If done right, I figured this could be a bizarre and interesting visual experiment… When I signed to Interscope, I made it clear I wanted artistic control over what I do. Granted, this is an extreme example."[38] "Happiness in Slavery" depicts a man willfully giving his body up to be consumed by a death machine. It features full male nudity and graphic, torturous violence as the machine pulls, drills, and grinds the victim's body in gory closeups. The video was meant as an affront to the dominance of MTV and their programming, which Reznor called generic, advertising videos to influence the music tastes of the public.

Although intentionally hyper-aggressive, *Broken* continued NIN's streak of commercial popularity and critical praise. The single, "Wish," even won a Grammy award for Best Metal Performance, which Reznor remarked was the only song to win a Grammy containing the lyric "fist fuck."[39] After two years of professional limbo, NIN emerged with a new EP and a new record deal with Interscope, which included Reznor's own subsidiary label "Nothing," and a rejuvenated interest in pushing boundaries.

Reznor's next full-length album would come from a truly haunted place. He converted the infamous site of the Manson family murders, the Tate house at 10050 Cielo Drive, into a recording studio, named "Le Pig," where he both lived and worked. The ghoulish history of the site creeped into the record as many songs feature the word

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[38] Deborah Russell, "Reznor Nails Down Extreme Clip," *Billboard*, Dec 5, 1992, 44.

[39] Nine Inch Nails, "Wish," *Broken*, Nothing/TVT/Interscope 7 92213-2, 1992. "Wish" won the Best Metal Performance Grammy in 1993.

"pig"—the words scrawled by Manson's followers—in the lyrics or song titles.[40] The album evolved as a concept record following the personal introspection of an individual questioning society and its structures of control while falling deeper into sex and drug addiction, dehumanization and suicidal thoughts. Reznor prepared himself for commercial failure with the uncompromising material, "If you're not ready for it, it's terrible, it's noise."[41] *The Downward Spiral*, released in March of 1994, became NIN's most popular album, debuting at number two on the Billboard 200 chart and remaining Reznor's best known work.

Reznor backed away from the guitar, bass, and drum formula of *Broken*, even if the instruments were heavily processed in the end. *The Downward Spiral* returned to Reznor's moody computer sequencing and a renewed interest in electronic music, citing David Bowie's *Low* as the main influence for the record. *Low* was an experimental record largely centered on the emotional pain involved with kicking a drug addiction. It was the first in a series of albums that came to be known as the "Berlin Trilogy," when Bowie had moved from Los Angeles to Berlin in order to rehabilitate and record new music. He and co-producer Tony Visconti began working with noted synthesist Brian Eno, formerly of Roxy Music, to produce a largely electronic-based record. Eno played

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[40] Pig had been written in blood on the door at the time of the murders. It was inspired by the song "Piggies" on the Beatles' White Album, which Manson claims predicted a coming apocalyptic race war. Reznor would keep the door and moved it to his future base of operation, Nothing Studios, in New Orleans.

[41] "The Rock and Rage of Reznor," *USA Today*, Aug 1994, http://www.theninhotline.net/archives/articles/xart1.shtml.

various synthesizers from Moog, ARP, and EMS, resulting in an ambient soundscape that would come to influence Kraftwerk and other synth-based bands. The sound was a radical departure from Bowie's previous work, though conceptually Bowie had always explored futuristic themes in his music. *Low* contained many instrumental passages as Bowie and Eno created texturally elaborate soundscapes. The reference is clear when listening to *The Downward Spiral* in terms of mood, timbres, and a film-score style running order, in which instrumental mood pieces interweave with more traditional songs.[42]

Reznor, co-producer Flood, and engineer Sean Beavan equipped the makeshift Le Pig studio with an impressive list of advanced technology during the early '90s. The foundation of the recording setup was a Macintosh computer running the digital audio workstation (DAW) Pro Tools. Most recording was done direct to computer, including guitars and vocals. The approach was unorthodox for the time, but Reznor liked the bright, immediacy of the sound and the ability to arrange tracks within the software. Beavan later recalled, "The processing in the computer was interesting, even though it was kind of rudimentary at that time—always on the cutting edge, we'd do things that no one else had done before." The studio also featured an Amek Mozart console with legendary Rupert Neve preamp modules that were used to EQ and distort the sound.

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[42] David Bowie, *Low* (RCA 1977). Both sides of the record contain synthesizer, but side two is mainly instrumental synthesized soundscapes with very few lyrics or singing at all. Side B of Low becomes a significant landmark for the sound of avant-garde electronic music entering the pop mainstream.

Rhythms were built with a Roland R70 drum machine, Akai S1100, and Kurzweil K200 samplers. A variety of analog synthesizers were employed, including a Minimoog, ARP Odyssey, Prophet VS, Oberheim Xpander and OB-Mx, Roland MKS-80, as well as the virtual software Digidesign Turbosynth. A particularly special piece of gear brought in was John Lennon's Mellotron MKIV, used famously on the opening of "Strawberry Fields Forever," which Interscope head Iovine had loaned to Reznor. The recording space, console, and equipment were set up in the ominous living room where Sharon Tate's body had been discovered.[43]

Reznor was no longer looking to bring a dark context to pop structures or infuse danceable beats into industrial music. *The Downward Spiral* came together as a cohesive, moody work of art from its lyrics, themes, music and art direction. The album is a bleak meditation on control. The introspective narrator exposes the power of society, the government, organized religion and addiction to breed conformity or silence. Stripping away the imposed order brings a frightening, isolated chaos. The rebellion is costly and not necessarily positive for the narrator, who descends the downward spiral to the edge of suicide.

Reznor told *Kerrang!* magazine, "every society is based on control, which equals power… I'm aware of that, I'm addressing it, I'm challenging it."[44] This statement by

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[43] Richard Buskin, "Nine Inch Nails 'Closer,'" *Sound On Sound*, Sept 2012, http://www.soundonsound.com/sos/sep12/articles/classic-tracks-0912.htm.

[44] Steffan Chirazi, "Techno Fear!," *Kerrang!*, Apr 1994, http://www.theninhotline.net/archives/articles/xart43.shtml.

Reznor can be seen as analogous to Attali's notion of the political economy of noise. By using dark and disruptive sounds, Reznor intentionally challenges the harmony of the mainstream order. The music reflects a breaking apart of social mores by a desperate individual. Reznor uses the new technology of the computer as a landmark shift from music of the past. He is forward-thinking in his approach to sequencing, arranging and production, which will become the way most music is recorded less than a decade later. The arrival of new instruments, or in this case music technology, indicates that a reordering of society is imminent. In its early stages, the new sounds are usually considered abrasive, unfamiliar or noisy. Reznor capitalizes on digital glitch distortion, produced by software errors and overloaded signals, to craft the sound of future dystopia. According to Attali, noise, as a contrary force to order, must win the battle and subvert the power structure or be silenced. The main character of the concept record may inevitably lose the battle. However, Reznor's commercial popularity and the dramatic societal shift caused by the personal computer and online life indicates that he actually was foreseeing a new online culture.

The opening track, "Mr. Self Destruct," begins with a sample of George Lucas's dystopian science fiction movie, *THX 1138* (1971). In the futuristic film, society is kept docile by a mixture of drugs and an android police force. People are made to wear the same basic white clothing, shave their heads, and mindlessly serve the State by building robots or watching constant surveillance monitors. Sex has been outlawed and the characters are forced to take their prescribed medication to remain calm. As two of the

character's begin to defy the rules and experience love and a relationship, the State intervenes imprisoning them. THX 1138, as he was named, will eventually escape, while the others inmates are recaptured, die fleeing or are used for their organs by the State.[45] Reznor's lyrics echo the plot of control in the film and his rebellious moments come with blasts of loud, distorted noise. He alternates between speaking and screaming until the song erupts into factory rhythms and buzzsaw guitar eventually morphing into a loop of cacophonous noise.

The greatest physical call to action is the track "March of the Pigs," a frenetic tour de force at a blazing fast 269 beats per minute mixing 7/8 and 4/4 time. The entire track sends the listener's adrenaline into overdrive. It is unsteady, unexpected, and brutal. Aggressive power chords and shouted lyrics break into soft piano endings; long silent pauses keep the listener on edge until the furious sound returns at an unfamiliar cue. Reznor calls his pigs in line and incites the rebellion, "I want to break it up I want to smash it up I want to fuck it up / I want to watch it come down / Maybe afraid of it let's discredit it let's pick away at it / I want to watch it come down." He becomes the ringleader, although positing that he may be ripped apart for standing in a position of power. In the live performance, "March of the Pigs" elevates the intensity of the crowd to a dangerous level. It is becomes the vent of anger, rage, and physicality bottled within Reznor and his audience. The violence of the then-popular mosh pit became a legitimate

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[45] *THX 1138*, directed by George Lucas (Burbank: Warner Home Video, 2005), DVD.

fear of parents, while their children embraced the physicality as a cathartic release of suppressed energy.

Other tracks explore Reznor's bitter rage and dark emotions. The song "Heresy" riffs on philosopher Friedrich Nietzsche's "God Is Dead" concept. Reznor uses the phrase to attack dogmatic Christianity: "Your God is dead and no one cares / If there is a Hell I will see you there." "Closer" became NIN's most popular song because of its explicit chorus, "I want to fuck you like an animal." The beat prominently features a sample of Iggy Pop's "Nightclubbing," produced by Bowie during the Berlin period. The video, directed by Mark Romanek, was a hit on MTV, although heavily edited to remove anti-religious imagery, BDSM fetish paraphernalia, and nudity. The uncensored video was made available for download from nin.com. The song hinges on sexual escapism by using dominance over another, and the faux-vintage look of the video and risqué imagery only added to its subversive appeal. Paranoia was the theme of "Ruiner," "You had all of them on your side, didn't you? / You believed in all your lies, didn't you?" In the first half of *The Downward Spiral*, Reznor lashes out at the forces he blames for controlling and destroying his life. In the second half of the album, his character begins to emotionally numb while descending into suicidal depression.

In "The Becoming," the narrator transforms into the cold emotional state of the machine. A clipping drum machine pattern lays out a mechanically perfect 13/8 time signature. The clanging of machinery is overlaid with terrifying screams sampled from the post-apocalyptic film *Robot Jox* (1990), in which wars are fought via a boxing-style

battle between piloted, giant robots.[46] The track's title derives from an idea Reznor expressed in the promo sheet for his previous EP: "Broken marks phase three of nine inch nails: the becoming / I am starting to realize what this is all about / and I don't like it."[47] Within *The Downward Spiral*, "The Becoming" represents the moment of change. It is the point where his humanity and hope are ultimately lost.

Reznor explores a type of cybernetic evolution transitioning his physical body into a cold cyborg. Although the emotional pain present in most of the songs begins to dissipate, it comes at the cost of true feeling and human connection. The second verse examines the transformation, "All pain disappears it's the nature of my circuitry / Drowns out all I hear no escape from this my new consciousness / The me that you know used to have feelings / But the blood has stopped pumping and he's left to decay / The me that you know is now made up of wires / And even when I'm right with you I'm so far away." The song descends into a nightmare where Reznor repeatedly screams, "It won't give up it wants me dead / Goddamn this noise inside my head," over the mechanical rhythms and looped screaming from the song's beginning.

After "The Becoming," *The Downward Spiral*'s narrator begins to succumb to madness. "I Do Not Want This" builds intensity as the character enters a mental break. "Big Man With A Gun" parodies the overt misogyny of gangsta rap, a genre that Reznor

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[46] The movie poster tagline reads, "The Ultimate Killing Machine. Part Man, Part Metal." *Robot Jox*, directed by Stuart Gordon, (Los Angeles: MGM DVD, 2005), DVD.

[47] Nine Inch Nails, "Broken Promo Sheet."

was associated with by conservative politicians advocating the censorship of popular music. He continues to juxtapose very quiet, delicate instrumental passages with overwhelming builds of noise and screaming for the remainder of the album. Mechanized rhythms overtake every song in the second half. "Reptile" begins with samples from the deep-sea sci-fi horror *Leviathan* (1989), in which genetic experimentation turn humans into murderous mutant beings. "The Downward Spiral" opens with a repeated instrumental motif being played over looping drones and the sound of flies. The track builds as distorted lo-fi screams fill one side of the panned stereo image, and Reznor speaking on the other side narrates the suicide of the main character. It goes silent, running into the ghostly static that begins the final track, "Hurt." An effected guitar plays over drones of noise as the musical track and Reznor's singing gradually builds. The lyrics speak to self-reflection and an ultimate sense of failure. The end words are softly sung while heavily distorted guitar ring out the final dissonant chords. One last noise drone continues for the final minute of the album mix.[48]

If, on some level, *The Downward Spiral* reflected the tortured psyche of Trent Reznor, then the ending was not therapeutic. The effect of stripping away layers of control spiraled into a hardened, mechanical isolation to the point of losing the value of human life. Although "Hurt" at least suggested the possibility of starting again. Reznor

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[48] Lyrics from liner notes to Nine Inch Nails, *The Downward Spiral*, Nothing/TVT/ Interscope 7 92346-2, 1994. Johnny Cash would later cover NIN's "Hurt" for the Rick Rubin American Recordings sessions. The video would also be directed by Mark Romanek, who did the video for "Closer." Reznor was flattered by the cover, but found it surreal to hear Cash sing what was a very personal song of his.

looks back on the period as a point of frustration and struggle to keep control of himself and his vision.

Reznor was now a full-fledged rock star with a rabid fan base, commercial expectations, label pressures and an exhausting amount of live dates ahead. *The Downward Spiral* tour cycle, appropriately named The Self-Destruct Tour, culminated in NIN's visceral Woodstock (1994) performance.[49] Meant to celebrate the 25th anniversary of Woodstock, the '94 festival was regarded as a commercialized nostalgia event with corporate sponsorship. The festival was broadcast on cable via pay-per-view, and like Lollapalooza, NIN's industrialized angst was the breakout surprise hit. Their Saturday night performance came directly after original Woodstock veterans Crosby, Stills and Nash, and the gap between the older generation and the new alternative nation could not have been made any clearer. Reznor admitted the only reason he performed was for the money, a healthy sum that would go towards funding the rest of the tour. The spirit of the 1960s had gone up for sale.

Crosby, Stills and Nash were followed by the mechanical rhythms, distortion blasts and chopped samples of *Broken*'s instrumental opener, "Pinion." Reznor and his band members had coated themselves in mud prior to the performance and took the foggy stage, looking like crusted techno-tribal warriors. They broke into the first song, "Terrible Lie," an angry accusation of God's abandonment featuring Reznor's desperate

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[49] Woodstock 1994 was conceived as a twenty-five year anniversary celebration of the original Woodstock festival.

screaming at the heavens. The exhausting sixteen song, eighty-minute long set was a physical exhibition of NIN's electrified rage. The crowd erupted into a brutal mud-soaked mosh pit. Reznor and his bandmates destroyed equipment throughout the set, which culminated in the anti-commercialism anthem "Head Like A Hole," perhaps the perfect song to subvert the Pepsi-sponsored festival. The entire performance looked like a dystopian nightmare that would have terrified the original Woodstock hippies.[50] The chaotic future vision of NIN in '94 was perhaps a warning of what was to come during Woodstock '99, a double-dip into the nostalgia cash machine resulted in rage-inciting financial exploitation of concertgoers, lack of basic necessities, violence, arson and rape.

With exhaustion and pressure mounting, Reznor began to lose himself in drug and alcohol addiction. He would step back from the spotlight to enter rehab and then counseling, after losing his maternal grandmother, who had raised him after his parents divorce. It took Reznor another five years to release *The Fragile* (1999). He continued his computer-based approach of sequencing samples, loops and synthesizers, although *The Fragile* did rely more on conventional guitar and piano than *The Downward Spiral*. The two-disc record was another concept record based around Reznor's more ambient soundscaping and personal lyrics about his emotional pain and drug addiction.

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[50] The entire Woodstock '94 performance can be viewed at: "Nine Inch Nails - Full Concert - 08/13/94 - Woodstock 94 (OFFICIAL)," YouTube video, posted by "NineInchNails on MV," Nov 11, 2014, https://www.youtube.com/watch?v=3lbFfiLAj_A&spfreload=10.

Another critical and commercial success, the album debuted at number one and Reznor continued to prove the relevance of his artistic voice as the pop music outsider. The record was followed by another heavy dose of touring, during which Reznor slipped back into drug and alcohol addiction. A heroin overdose in London forced him to publicly address his personal demons.[51] He entered rehab once again in 2001 and would take another extended break between releases. This time reinventing himself mentally, physically and evolving the NIN concept around internet culture, information technology, and political commentary.

Now clean and sober, Reznor emerged in the mid-2000s with a renewed focus. He took up a strict regimen of exercise and transformed his spindly body into a thick, muscular physicality. Reznor buzzed his long hair and took on a sleek monochromatic wardrobe. Even his writing approach had become streamlined, including writing and recording demos with only a laptop, drum machine, and piano. Reznor and NIN had been rebuilt into a new version. He evolved the concept into a future-looking weapon against the voices of control in the post-9/11 millennium.

With Teeth, released in 2005, introduced the modern version of Nine Inch Nails. Although NIN had been missing from the scene for over five years, the album debuted at the top of the Billboard chart and a smaller-scale club tour immediately sold out. *With*

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[51] Reznor had previously been very critical of other Alternative Rock stars' heroin addiction, such as Kurt Cobain and his eventual suicide. Positioned his drug and alcohol use as "moderate," "in control," "doesn't do heroin." He begins to slip into heroin addiction after *The Downward Spiral*.

Teeth also marked a working partnership with co-producer and musician Atticus Ross, who would remain Reznor's main collaborator through the present NIN albums, side project How to destroy angels_ and Reznor's recent film work. Visual artist Rob Sheridan, who had taken over NIN's art direction in the late 1990s, also began introducing his analog video glitch signature to NIN's visuals. The collaborations reflected NIN's move away from being the intimate, introspection of the singular Reznor.

Older electronic effects and instruments became an important part of his process on the new record, particularly analog synthesizers. As Collins points out, "In light of neophilia of consumerism, it is significant that the resistance does not choose (or cannot choose) the latest technology. The appropriation of older, particularly low technology for its use in the resistance is a theme running throughout cyberpunk and industrial."[52] Reznor, who had been at the forefront of computer-recording began to complain about the machine's influence on music, "computers, among other things, are ruining music these days. I hate the Pro Tooled sound of perfection and everything being 'fixed'."[53] The comment reflects a disdain for computerized perfection, but not necessarily the technology. *With Teeth* is described as a laptop album, meaning that Reznor built the tracks from loops that he could arrange on the computer in a digital audio workstation, much in the same way that he worked before, only more portable and allowing Reznor to

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[52] Collins, 172.

[53] Jason Pettigrew, "Nine Inch Nails," *Alternative Press*, Nov 2003, http://www.theninhotline.net/news/archives/backissue.php?y=03&m=11.

work while touring. Laptop music making is commonplace now, but Reznor was an early adopter of the mobile recording technology. His criticism is about an over-reliance on the automated correction of the software, which removes the idiosyncratic human touch and arguably the soul. Reznor's mastery was always in manipulating the machine, but fiercely holding onto the humanity. In his hands, it was more about the glitches produced by software errors, noise collage and sequencing, pushing the machine into its creative and functional limits and taking advantage of the noisy overloads. The auto-tuned, beat-corrected pop is the soulless product he has always raged against. As the computer is co-opted by mass market music to produce a trivial product, Reznor again becomes the cyberpunk hero who exercises a mastery of older technology to battle the status quo. His return to analog synthesizers is a fascinating move back to an older analog technology that now seems more human in a digital age. There are buttons, knobs, and tactile surfaces. The old machines, once so futuristic, have an aura of nostalgia, much like vinyl records in comparison to compact discs or audio files. *With Teeth* represented a blend between electronic music's history and its laptop future.

Physical formats also began to weigh heavy on Reznor's mind. The CD became a major point of contention. Albums and art had significant meaning to him, an exploratory process that was part of the overall concept and the reason that NIN had dedicated art directors and carefully selected video directors or art contributors, under the direct supervision of Reznor. Other bands may have left such stylistic decisions to their record label. With the rising success of the iPod and music downloading, Reznor told the

Toronto Sun, "I'll immediately put the CDs I buy in my iPod and then I lose them… They're junk. It feels like we should just by-pass packaging all together."[54] Reznor was already seeing the future of the medium demonstrated in the rise of downloading/ streaming and the niche vinyl resurgence, a blend of the the older analog and most advanced digital technologies. Instead of printed materials packed into the *With Teeth* CD case, Reznor provided a link to nin.com where fans could download a digital version of the liner notes and full artwork. Music distribution became a problem to solve. He would rethink the process of the concept album and craft an unparalleled multimedia experience for his next album.

On *With Teeth*, Reznor focused on the potential of the public to succumb to a surveillance state in response to the threat of terrorism following the attack on New York's World Trade Center. He told *Kerrang!*, "Shortly after I got clean 9/11 happened… It feels like we're in this weird police state now. The government isn't telling us the truth, fear is now being pumped into our homes as a great motivator to just do what you're told."[55] Instead of rebelling against the things that he saw trying to control him, Reznor was now tuning into how society was reconfigured for control during a war on terrorism. He understood that information control would be the biggest point of contention.

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[54] Lisa LaDouceur, "New With Teeth CD to Package More Punch," *Toronto Sun*, May 20, 2005, http://theninhotline.net/archives/articles/manager/display_article.php?id=116.

[55] Stevie Chick, "To Hell and Back," *Kerrang!*, March 30, 2005, http://www.theninhotline.net/archives/articles/manager/display_article.php?id=21.

Although NIN had a long history of broadly condemning state and religious institutions, another disaster, Hurricane Katrina, and the slow response toward disaster relief in New Orleans, directed NIN's ire specifically at President George W. Bush. Reznor had adopted New Orleans as his hometown and base of Nothing Studios for roughly a decade before Katrina wreaked havoc on the city. He joined relief efforts from benefit performances, auctioning equipment, and releasing a downloadable charity single. Reznor echoed many voices in criticism of President Bush's handling of the crisis and was set to make a strong political statement by performing the *With Teeth* track, "The Hand That Feeds," at the MTV movie awards in front of a background depicting the President. When MTV refused, Reznor pulled out of the performance and lashed out on his website, "We were set to perform 'The Hand That Feeds' with an unmolested, straightforward image of George W. Bush as the backdrop. Apparently, the image of our President is as offensive to MTV as it is to me."[56] Reznor channeled his anger back into the recording studio, this time creating a science-fiction dystopia, imagining the future if political leadership did not change course.

NIN's 2007 album, *Year Zero*, was the band's most ambitious concept record and viral marketing endeavor. The cryptic jaunt through computer-based communication began when fans noticed highlighted letters on NIN tour shirts that directed them to a web search. A network of websites provided cryptic clues. Tracks from the upcoming

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[56] James Montgomery, "Nine Inch Nails Drop Out of MTV Movie Awards Over Bush Dispute," MTV.com, May 27, 2005, http://www.mtv.com/news/1503082/nine-inch-nails-drop-out-of-mtv-movie-awards-over-bush-dispute/.

album were leaked on USB drives hidden at NIN live shows that pointed the way to a phone number that played a track when called. The network continued to grow as an alternate reality online experience, expanding in scope, story and participation to three million users worldwide. A select few, directed by prepaid cell phones, were treated to an impromptu concert by NIN, announcing *Year Zero*'s release.[57]

Year Zero is a dystopia set in 2015 after a totalitarian government assumes complete control over the United States and its people using a state-authorized religion, wire-tapping and the prevention of bio-terrorism threats as justification for their absolute authority. The government relies on pharmaceutical drugs to keep the public docile, as well as produce superhuman soldiers. GPS tracking chips are implanted, so that any individual could be tracked. An underground resistance has formed, which the audience is participating in through the alternate reality game. It is clear from interviews that Reznor took on this subject matter in disapproval of the Bush administration and a paranoia over dissolving civil liberties. *Year Zero* describes the breaking point, when this world would inevitably reach its limit of suppression and answer back in subversive rebellion.

"Survivalism" was the major single released off of the concept album. Lyrically, the song has much in common with the thematic critiques posed by the industrial genre.

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[57] The Alternate Reality Game (ARG) was a collaboration between Reznor, Sheridan and 42 Entertainment. The game was self-financed by Reznor and considered to be a part of the total Year Zero art concept, not just promotional. A complete retrospective on the ARG can be viewed at: 42 Entertainment, "YEAR ZERO Nine Inch Nails | Trent Reznor," Accessed March 9, 2015, http://www.42entertainment.com/work/yearzero.

"Survivalism" describes a brutal machine age where a gluttony for resources has raped Mother Nature, "She gave us all she had but / We went and took some more / Can't seem to shut her legs our / Mother Nature is a whore." The chorus makes a cultural critique on how the reality of a depraved existence has been satiated through technology and hints that he is about to break free of it all. Reznor bellows, "I got my propaganda I got revisionism / I got my violence in high-def ultra-realism / All a part of this great nation / I got my fist, I got my plan, I got survivalism."[58]

"Survivalism's" music video depicts the band performing in an apartment building that is being monitored by a closed-circuit television network. The innovative video juxtaposes subversion with surveillance, as the viewer takes the uncomfortable position of the "watcher," whose eyes rapidly move from screen to screen invading the privacy of each home. The combination of imagery and music is unsettling. A police special forces team enters the complex and begins tactically moving through the apartment building's hallways. In the end, it is the band that is silenced by the authorities, indicating that music is the most dangerous and subversive element of all. The video questions the sanctity of private space under a regime's overseer and the threat of being neutralized by its military muscle.

Year Zero's online concept suggests new possibilities in storyline interaction. Given industrial music's penchant for technology, it is not surprising that nin.com embarks on an unparalleled level of fan involvement through online culture. It is clear,

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[58] Nine Inch Nails, "Survivalism," *Year Zero*, Interscope B0008921-02, 2007.

within just a few minutes of browsing, that NIN is promoting and developing a rich online community. Previously hosting a fan message board through which Reznor communicated directly with fans in the '90s, NIN is currently active on all levels of social networking including Facebook, Twitter, Instagram and Tumblr. Reznor saw the potential in direct online communication decades earlier and used it to build a loyal, connected fan base.

Nin.com enriches the fan experience even further. Each album is frequently launched with dedicated websites including bonus content to download. The links section will guide you on a virtual tour of Nine Inch Nails on the web. Merchandise and tour info is clearly laid out and promotes the ethical stance that true fans have exclusive early access to NIN products or concert tickets in a world of eBay auctions and third-party ticket resellers. Fans can communicate with other fans through the social media networks. Furthermore, users are actually encouraged to post pictures and videos, especially of live performances. Membership is free, a novel idea in itself. In an era of piracy wars where bands and record companies have grown increasingly distant, and maybe even hostile to their audience, NIN's level of access is inviting and offers a unique model of electro-grassroots participation and the embracing of open-source online culture. As the industry changes, the NIN model of fan engagement, free content and social media is now becoming the operating standard.

For an American Studies and popular music scholar, the most exciting feature of nin.com is the Remix section.[59] Registered users can download multitrack audio files that allow the fan to create a personalized remix with the actual source stems from their favorite songs. Source files come in three formats: Generic WAV files that can be used in various audio programs, Ableton Live format or Apple's Garageband format. The multitrack file literally opens up the components of a song on your screen, just as Reznor would see them within his digital audio workstation. The user is given complete access to individual master tracks, instruments, waveforms, playback, mixing and editing. Users are then encouraged to playfully remix their own versions, a truly tactile and creative music experience that breaks down the barrier between fan and band. Once the user has created a remix, they simply upload their mp3 to the remix website, which adds the song to a streaming playlist for other members of the community to listen to, comment on and rate. Reznor also participates in the remix section, giving fans unexpected bonus songs and undoubtedly receiving live feedback on the tastes of his audience. This unprecedented level of accessibility and interaction is revolutionary. In addition to a creative outlet for deepening fan participation, multitrack audio may be a key into the future of academic musical inquiry.

Consider the possibilities for studying a piece of music through multitrack audio. Rather than an abstraction of music written as notes on a score, the listener can both

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[59] The official Nine Inch Nails remix website can be found at: Nine Inch Nails, "Remix," nin.com, accessed March 9, 2015, http://remix.nin.com.

visualize and listen to how a song is constructed in real time via waveforms. Using NIN's Garageband multitrack audio file for their song, "Survivalism," the opportunities for a new model of musical analysis are evident and exciting. Downloaded and opened in a couple of minutes, "Survivalism" is instantly broken into its component parts within the computer program. There are eighteen separate instrument tracks with their own line of audio information stacked on the overall grid. Each instrument is clearly named providing the listener with basic information about the individual parts of the song. Upon playback, it is easy to visualize when each instrument track enters or drops from the mix. By utilizing the solo (mute) options, the listener can choose to listen to all instruments at once, any single instrument or any combination of instruments. These techniques would be familiar to anyone who has previously recorded music on a digital audio production program and are increasingly available to everyone, especially on the Mac OS X platform which comes preloaded with the GarageBand application for free. Changing the focus from musical production to multitrack analysis allows a new perspective for music scholars.

Soloing an instrument permits the listener to narrow their attention specifically on timbre. It seems that music scholarship has veered away from discussing sound elements in favor of melodies, harmony, or counterpoint as a written form. Industrial music, in addition to other technologically reliant music, has provided a challenge for musical notation. This limitation arises from the tools of analysis, how notes interact on a score. Multitrack audio reintroduces timbre to the forefront of musical discussion. Aggressive

distortions, controlled glitch sounds, synthesized instruments, ambient noise and mechanized palettes are paradoxical to musical notation as there is no satisfactory way of translating noise that does not rely on conceptions of pitch and rhythm. In multitrack audio, technologically dependent audio can be isolated and analyzed by its aural characteristics and addition to its overall effect on the sound of a song.

"Survivalism" provides intriguing examples of alternative instruments and timbres. In addition to the standard vocals, guitars, bass, drums and percussion found in rock music, "Survivalism" implicitly relies on an array of electronic instruments. The percussion is expanded by five sets of synth, filtered and delayed drum parts. Rhythmic elements are also added through a synth slicer and a drum glitch track. Another synthesizer provides a unique melodic touch throughout the song. Even the guitars and bass are heavily filtered and effected, keeping with the abrasive and extreme sound of the band.

Perhaps the most fascinating discovery in the multitrack audio file is that Reznor has embedded effected radio noise samples into the track. The radio noise simply passes as obscured ambient noise when the track is played as a whole, registering ghostly and unintelligible whispers. Samples have been deeply embedded in popular music for decades, but multitrack audio files would allow for the clear isolation of such hidden parts. When isolated, only the processed radio noise can be considered, on its own or as a subtle part of the soundscape, as other instruments are reintroduced to the mix. If a turntable has attained status as an instrument, then there is no reason another playback

device, which has been manipulated and collaged, should be excluded. The advantage of isolating radio noise in multitrack audio provides a better understanding of what the listener is actually hearing and how the artist has constructed the instrumental break within “Survivalism.”

Multitrack audio simply provides a clearer picture of songs that rely on soundscape methods. “Survivalism” draws on a softer verse section and a pounding chorus to dramatize intensity and juxtapose aesthetic visions. “Survivalism's” chorus is a blast of loud white noise. Multitrack audio allows for a complex layering of sounds to be viewed and listened to as its constituent parts. The song’s chorus utilizes the majority of instruments available on the track creating a dizzying amount of audio information that overwhelms the listener. However, in multitrack audio, the chorus can be continuously repeated while the user isolates and combines any instrument desired in order to understand how parts are interrelated or built upon one another. One fruitful experiment would involve looping the chorus while one instrument at a time is added to the mix, allowing the user to reconstruct the layering of sounds into its final blast of noise. The waveforms, visible on screen, indicate other bits of audio information including attack and decay, as well as the dynamics or volume of each instrument. Finally, the panning and volume controls provide insight as to how the track is mixed, which instruments may prominently feature and how each is panned within the left and right stereoscope. These elements have no home on a written score, but dramatically change the listening experience of a piece of recorded music. If producing music in digital audio workstations

has become the norm in recording and production, then it should also be considered as a modern method of analysis.

Since 2007, Reznor has continued to embrace this open source interaction between the band and its audience. He broke away from major-label Interscope and his Nothing subsidiary to be completely independent, forming The Null Corporation to produce and distribute his music. His next projects included the instrumental *Ghosts I-IV* (2008), which explored the possibilities of an online self-release and full-length album, *The Slip* (2008), which Reznor simply gave away as a thank you for continued support. Nin.com and the nin: access mobile App have provided a resource for fans to access not only music, but conceptual art, remixes, videos, live performances, photos, merchandise and nearly anything imaginable related to NIN universe online or via mobile devices. It also encourages fan participation with concert presales, live chat, message boards, and remix culture. Multitrack audio files have been only a part of this exciting new musical model, demonstrating that modern music may be better understood in a multimedia context on the vanguard of technology.

An online-centered, multimedia fan experience has been the path Reznor continues to follow while branching out into varied projects in music, film and technology. How to destroy angels_, a collaboration between Reznor, wife Mariqueen Maandig and Atticus Ross, explored similar themes in a more electronic ambient noise landscape than NIN's usual techno-aggressive style. Synthesist and NIN touring member Alessandro Cortini and NIN's art director Rob Sheridan would later become members of

the new band to round out the touring lineup. Sheridan began a VHS glitch visual style to compliment How to destroy angels_, often manipulating live visual effects while on stage as part of the performance.

Reznor and Ross would also begin collaborating with director David Fincher to create a soundtrack for the Facebook-inspired film, *The Social Network* (2010). Although Reznor had worked on soundtracks in the past, it would be the first time that he would provide an original score for a feature film.[60] It was a challenge to soundscape a visual presentation, but Reznor seemed the perfect composer to provide the sound for a film that takes a darker look into the beginnings of online social networking. The score was met with critical acclaim and even garnered Reznor and Ross a Golden Globe and an Academy Award for their innovative sound textures. The pair would go on to score Fincher's next two films, *The Girl with the Dragon Tattoo* (2011) and *Gone Girl* (2014).

After nearly seven years of working independently under his own Null Corporation, Reznor's NIN project returned with *Hesitation Marks* (2013) released by major label Columbia. Reznor cited a faith in the independent method as valuable, but proved he successfully explored that avenue and decided to go with a major label's distribution power to save resources, time and effort on a major NIN release. At this point in Reznor's career, he would no longer have to fight the label over artistic control of his project and could rely on their network to distribute more effectively.

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[60] Reznor worked on the soundtrack for *Natural Born Killers* (1994) and *Lost Highway* (1997). Also, provided music for video game *Doom* (1993), and later *Call of Duty: Black Ops II* (2012).

Jimmy Iovine, who had since left Interscope and joined with Dr. Dre to release the overwhelmingly popular Beats headphone brand, tapped Reznor to become the Chief Creative Officer for the development of the Beats Music streaming service. The future of Beats Music division is in flux with the landmark $3 billion dollar acquisition of Beats by tech heavyweight Apple Inc.. However, Reznor has been retained by Apple and is rumored to be currently working on a revamped music streaming platform as the industry continues to push toward the streaming model. Although he could not discuss details when asked if the Apple project involved music delivery, Reznor recently told *Billboard*, "It's in that world. It's exciting to me, and I think it could have a big enough impact that it's worth the effort. I'm fully in it right now, and it's challenging, and it's unfamiliar and it's kind of everything I asked for—and the bad thing is it's everything I asked for."[61] After a long career of challenging the mainstream, playing the cyberpunk hero, rewriting the rules of online culture and directly taking on the President, Trent Reznor may literally be conceiving the future of music in partnership with the biggest computer technology company in the world.

Reznor began his career by voicing the anger of Generation X as a distorted challenge to a Conservative political era. He used the politics of noise, like his industrial peers, to subvert political control of information and prevent the erosion of personal

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[61] Joe Levy, "Trent Reznor on turning 50 'With Some Sense of Dread,' the Future of Nine Inch Nails and a Top-Secret Apple Project," *Billboard*, Oct 31, 2014, http://www.billboard.com/articles/news/6304122/trent-reznor-talks-nine-inch-nails-scoring-gone-girl-apple-project.

freedoms. Reznor saw the potential of the computer and online culture early on, not only as a tool for music production, but as a method of direct connection and community building among fans within a new online space. Nine Inch Nails' music is largely atmospheric, relying on textures of sound and digitized construction, which require new models of analysis, either the sound studies approach taken here or the suggested potential for multitrack audio studies in the future. His music and artistic message continues to evolve at the rapid pace of technology—employing laptop-based production, digital audio workstations, and promoting remix culture and online sharing. By staying at the forefront of music and technology, Reznor has transitioned from caustic musical outsider to the creative mind behind online streaming's next evolution.

CHAPTER FIVE - THE HAU5 OF THE MAU5: DEADMAU5, ELECTRONIC DANCE MUSIC AND ONLINE COMMUNITY

"I'm interested in two things: music and technology. I'm not interested in clubs, I'm not interested in being in the middle of 80,000 person crowd and 'having the time of my life.' That's my idea of hell."[1] — Deadmau5

The digital techniques embraced early by Trent Reznor have become one of the standard means of creating music in the new millennium. Tracks are constructed and recorded in digital audio workstations using an array of software synthesizers, effects and automation. At the forefront of this technology is electronic music producer Deadmau5, who employs the computer to create, promote, distribute and perform his brand of modern dance music, while maintaining a participatory virtual world for his fans. Attali's ideas of noise politics carry over into modern electronic music as distortions, disrupted rhythms and dark timbres, expressing paranoia over internet culture, isolation and surveillance. However, positive representations of connected life are also present in Deadmau5's music. The existence of remix culture, driven by the immediacy of Twitter and streaming services, provide evidence of Attali's composition stage in which music can be a vital, collaborative space of social engagement and commentary. Through the

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[1] Todd Burns, "Deadmau5: it's complicated," Resident Advisor, September 30, 2008, http://www.residentadvisor.net/feature.aspx?972.

evolution of electronic dance music, the euphoric transcendence inherent to the communal dance floor can be transferred to online communities as individuals begin to mediate their relationship to technology and virtual space.

In this chapter, I argue that Deadmau5 and electronic dance music reflect a youth culture that assumes digital life as a new reality. I begin by transitioning the communal ideology of the dance floor, exhibited in House music and Techno, into the virtual world of online fan culture. I demonstrate how the tools of music production and performance blur the distinction between the two modes of music making for the modern DJ/producer. Using the example of Deadmau5, I investigate how online life is mediated through social networks. A deeper inspection of his work illustrates the culture of an emerging generation of Millennials. Deadmau5's music provides a multimedia spectacle of utopian and dystopian themes that speak to the new generation's multitasking anxiety and euphoric anticipation of delayed gratification, all heightened by an empathic drug culture. Lastly, I look to Deadmau5's online fan community, hosted on live.deadmau5.com, as a unique case of artist and fan collaboration, specifically on the track, "The Veldt," as an illuminating example of online connected life.

Disco linked dance-driven electronic music with nightclub culture in the 1970s. Relying on traditional rhythm and blues instruments in its early days, disco's incorporation of the synthesizer owes much to the late-70s euro-disco production of Giorgio Moroder on genre staples sung by Donna Summer, including "I Feel Love" and "Love to Love You Baby." The use of the synthesizer complimented the booming

speaker systems of the club, pumping out reverberating bass frequencies that dancers could physically feel. Soon, mechanized drum patterns produced a rhythmic regularity that would be impossible to sustain for any human player. These electronic qualities contributed to a backlash against disco as overly mechanical and superficial at the height of its popularity. Even with disco's quick demise in popular culture, electronic dance music continued to thrive in clubs and disco evolved into a genre known as House.

As DJ historians Bill Brewster and Frank Broughton recount, "In Chicago, as the seventies became the eighties, if you were black and gay your church may well have been Frankie Knuckles's Warehouse, a three-story factory building in the city's desolate west side industrial zone."[2] Knuckles experimented with disco and soul records alongside new consumer-grade music technologies, the drum machine and bass synthesizer. His production style featured repetitive 4/4 beats with a synthesized kick drum on the downbeat and hi-hats on the offbeat, produced most famously by the Roland TR-808 drum machine. Synthesizers also provided fat bass tones as the looping rhythmic elements were often the focus of the music, if not the entirety of the song. Knuckles would creatively remix tracks, add layers of electronic sound,and make lively edits by tape splicing. Eventually, electronic instruments became part of the performance as drum machines and bass synthesizers were played alongside spinning records to add a sharp rhythmic emphasis to the music. The new genre took the name House from The

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[2] Bill Brewster and Frank Broughton, *Last Night a DJ Saved my Life: The History of the Disc Jockey* (New York: Grove Press, 2000), 292.

Warehouse, where Knuckles spun records and built his club following. By 1984, Trax Records, an independent House music record label, began pressing vinyl singles and distributing the new style of music produced by Knuckles, Marshall Jefferson, and other House DJs, finding markets in other parts of the country and overseas. The label helped spread the local Chicago scene into a global dance culture.[3] House crossed over into mainstream pop music in the 1980s with artists like Madonna, who formalized and helped commercialize the sound of electronic instruments and their mechanical beat.

House's rhythm platform was defined by three influential synthesizers produced by Japanese manufacturer Roland, the TB-303 bass synthesizer, and the TR-808 and TR-909 drum machines.[4] The repetitive nature of the music and simple fundamental chords and melodies are used as, "a device to display timbre, texture, tone-colour, chromatics."[5] Still, everything typically serves the rhythm, even the repeated bits of melody. The electronic instruments produced a perfect synced bass and drum track that removed the human elements of performance exhaustion and rhythmic errors from music. As electronic music historian Simon Reynolds explains, "The very inhuman aura of electronic music is part of the culture's obsession with the future, whether that is conceived as a utopia of streamlined pleasure-tech, or a dystopia of control and

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[3] "About Us," Trax Records, accessed March 9, 2015, http://www.traxrecords.net/about.htm.

[4] Roland released the TR-808 in 1980, the TB-303 in 1981, and TR-909 in 1983.

[5] Simon Reynolds, "Historia Electronica Preface," *The Pop, Rock, and Soul Reader: Histories and Debates*, 3rd ed., ed. David Brackett, (New York: Oxford University Press, 2014), 505.

automation."[6] Some feared the implications of the mechanical music, but the tireless loops pushed dancers into a hypnotic trance.[7] It also shifted the focus of performance from watching a band on stage to the importance of the audience interacting and moving to the music. Sound made a bodily connection with the club dancer and between those on the dance floor, becoming the entire focus of the live experience.

Around the same time as House music was taking hold of Chicago clubs, another electronic style was developing in Detroit. Known as Techno, it was faster than House music and more experimental in its use of noise. Techno still features highly repetitive rhythms in 4/4 time, but aims at producing stronger commentary on the relationship between man and machine, evident in the Afrofuturist themes of Techno pioneers Derrick May, Juan Atkins, and Kevin Sauderson.[8] Techno marked the return of futuristic synthesizer leads in the style of George Clinton's Parliament. Atkins soon formed the Techno band Cybotron, which relied on an array of synthesizers, drum machines and electric guitar. The band's singles "Cosmic Cars" and "Techno City," released in the early 1980s, helped establish Techno as another distinct genre of electronic dance music that would utilize the new digital synthesizers entering the market as foreign imports.

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[6] Reynolds, 505.

[7] A critical reading of Kraftwerk's pioneering electronic music reveals both a celebration modern technological life with dystopian underpinning of a soulless, automated mechanical existence.

[8] Mark Butler, *Unlocking the Groove: Rhythm, Meter, and Musical Design in Electronic Dance Music* (Bloomington: Indiana University Press, 2006), 41-44.

Digital technology moved quickly in the world of dance music, such as in other emerging genres like hip-hop. New electronic instruments made use of microchip processors to recreate the voltage controls of analog synths as binary code operations. The Yamaha DX7, released in 1983, was the first successful polyphonic digital synthesizer on the consumer market. As Pinch and Trocco note, "The DX7 sold 200,000 units in three years, compared with the Minimoog's 12,000 lifetime sales."[9] The price points of digital models were significantly lower and factory presets made playing out of the box much easier than patching complicated analog synthesizers. Digital technology ultimately democratized the sound of the synthesizer by making the instrument affordable and accessible.

However, as digital synthesizers entered the mainstream, they became increasingly defined by the modalities of computer technology. These instruments were almost exclusively keyboard-based, cementing the link between synthesis and the keyboard's tonal layout. Factory-selected preset options dictated the sounds, as most users simply used these easier options in place of programming new parameters into the internal computer. Digital patches are reliable for live performance and will sound exactly as expected when punched in, but this fact also makes them both predictable, and inhumanly perfect . Moreover, was impossible to recreate the trial and error process of wiring patches, turning knobs, and rearranging modules that resulted in the random

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[9] Trevor Pinch and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge, MA: Harvard University Press, 2002), 317.

accidental sounds of their analog counterparts. Many of the presets were designed to emulate other instruments, both acoustic and electric. While this was convenient for the working band, school, or church, who could use the synthesizer to cover multiple orchestral sounds, it realized the concern that synthesizers would become synthetic replacements for real instruments and cease developing in their own unique direction. Also, since the electronics were internally encased within the unit, users were less likely to try any sort of hardware modification.[10] The keyboard digital synthesizer provided a set palette of timbres, which became strangely limiting, although technologically advanced.

Still, since the instruments were digital and operated on binary code, there remained a major opportunity for creativity, by connecting the synthesizer to the computer and its emerging suite of notation and recording programs. A worldwide standard protocol for instruments called Musical Instrument Digital Interface (MIDI) was developed to transfer musical information across digital devices. MIDI data functions are controls that can be routed to other hardware or virtual instruments to determine pitch, volume, effect parameters, panning, and much more. MIDI also syncs clock time across connected instruments, allowing them to play together in time to a set master tempo. The final revelation was that MIDI could communicate with computers. The ability of the computer to record MIDI commands, relay information to external hardware and run

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[10] Ibid.

instrument software programs completely revolutionized the way music is produced, recorded, and performed.

MIDI redefined the role of the sequencer in digital music production. The sequencer still functions as a pattern-based composition tool, as it did in its analog counterpart, but now transmits MIDI commands to a host of virtual instruments. This allows for complex song creation with a multitude of digital information translated at one time and flexible editing ability through common computer functions, such as copy and paste. The original Digital Audio Workstations (DAW), used early on by Trent Reznor in Nine Inch Nails, relied on MIDI transmission data for its recording commands and sequencing capabilities.[11] Sequenced MIDI data can also be synced for playback by the computer across software and external MIDI-compatible hardware at the same time. Reznor used digital sequencing to reproduce the electronic noise of Nine Inch Nails on tour. Similarly, DJs would begin relying on MIDI instruments and sequencing within live performance to provide greater flexibility and original material to their sets.

By the early 1990s, House and Techno styles began to dominate European dance clubs and splintered into countless sub-genres, including hardcore, jungle, drum 'n' bass, trip-hop, and ambient, to name just a few. The popularity of these electronic dance styles manifested an underground culture of all-night parties held at secret locations called

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[11] MIDI data is not recorded sound, but rather coded instructions for reproducing sound and other musical commands that must be run through synthesizers and other hardware or software-based instruments. It allows musicians to quickly click in notes via a piano roll, transpose keys, or shift tempo almost instantly without having to rerecord. This functionality is especially useful for the music production style of composition.

raves, which featured their own social rules, fashions, and drug culture.[12] A welcoming and inclusive raver ideology, stressing values of Peace, Love, Unity and Respect (PLUR), was spread through communal events and online message boards.

Rave culture, guided by the ideology of PLUR, gravitated toward the empathy-inducing drug, methylenedioxymethylamphetamine, commonly known as Ecstasy of MDMA, as the substance of choice to fuel an all-night dance party. As Brewster and Broughton point out, "It is hard to imagine a drug more conducive to the club experience. It gives you energy, it enhances light and sound and it can make a roomful of people drop their defense."[13] The explosion of Ecstasy use impacted the music in a reciprocal relationship. Reynolds explains this connection as a "drug-tech interface syndrome," in which, "Specific music-technology innovations have synergized with particular drugs at different points: for instance, Ecstasy meshed with the trippy bass-patterns of the Roland 303 bass-synthesizer to catalyze the Acid House revolution of the late Eighties."[14] Electronic dance music changed over time to reflect certain drug use patterns including faster tempos accompanying amphetamine use and psychedelic special effects for hallucinogenics LSD and ketamine.

Rave culture soon made its way to the United States with similar secret, all-night dance parties. The US government soon began surveillance on the growing scene and

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[12] For a detailed history of early rave culture see: Simon Reynolds, *Generation Ecstasy: Into the World of Techno and Rave Culture*, (New York: Routledge, 1999).

[13] Brewster and Broughton, 364.

[14] Reynolds, in Brackett, *Pop, Rock, and Soul Reader*, 507-508.

hosting a rave became both a risky financial and criminal gamble after the Criminal Justice Act of 1994.[15] As dance music continued to grow in popularity and moved onto the pop charts in the form of singles and remixes, promoters strayed away from the risks of illegal parties and moved performances back into nightclubs, concert venues, and large festivals. The rave movement lost its subversiveness, while the electronic instrumentation, House genres, and use of ecstasy entered the mainstream. Also, with a turn to legitimate venues and corporate sponsorship, DJs began to be assume rock star status and commanded similar sums per performance. By the turn of the twenty-first century, as Brewster and Broughton recount, "preparations for Millennium Eve showed just how out of hand it had all become, with top-rank DJs demanding fees well into five, six figures for a single performance."[16]

The trend continues into the new millennium, as electronic dance music (EDM) currently holds its strongest position ever in popular music. Dance has spilled over into most other genres, including pop, rock, hip-hop and even country, as artists and their labels pull in high-profile producers for collaborations or remixes that often outdo the original single in sales and chart position. Producers have even begun to eclipse the pop artist for whom they create the track. DJs now assume multiple roles of performer, producer, celebrity and brand promoter. Las Vegas and Miami hotspots have hastened this trend, paying top dollar for the biggest names in dance music. Brand recognizability

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[15] Brewster and Broughton, 395-398. The Act outlawed large, unlicensed dance parties.

[16] Brewster and Broughton, 386.

is a major draw for live event promoters who have pushed EDM from the club to the outdoor festival and arena. EDM now attracts audiences in the hundreds of thousands to multi-day festivals such as the Electric Daisy Carnival in Las Vegas, Electric Zoo in New York City and Ultra Music Festival in Miami. Also, EDM artists are increasingly on the bill, and even headlining, non-genre specific festivals like California's Coachella, New York's Governor's Ball, Tennessee's Bonnaroo, and Chicago's Lollapalooza festivals. The popularity is a global phenomenon with similar events taking place in the United Kingdom, Germany, Belgium, and Ibiza, all historical hotspots for dance music culture.

Reynolds points to a tenet of dance club culture that no longer rings true in the era of the DJ/producer megastar, a "refusal of our contemporary culture of the icon. Video is about spectatorship, whereas dance culture is about participation… there's nothing to look at: no theatrics, no performance vocabulary of flamboyant gestures."[17] Accompanying the large stages and high-profile performances, EDM stage shows have evolved into a multimedia spectacle designed to enliven all the senses. Inspired by the theatrics of the robot-helmeted duo Daft Punk, who performed atop an LED-illuminated pyramid for their 2007 tour, EDM acts feature elaborate stage setups with LED animations, massive screens, fog machines, pyrotechnic laser light shows and massive sound systems. All of these elements serve as a multimedia-driven distraction from the general lack of live "performing" occurring on stage, as preprogrammed dance music heavily relies on automated computer playback and synced stage visuals. Modern dance

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[17] Reynolds, 509.

music combines so many layers, effects and computer inputed notes that it would be impossible to "play" live. EDM events mainly provide a memorable experience, rather than live musicianship, that keeps audiences returning in large numbers.

One of the largest draws in EDM is a notoriously cantankerous producer, going by the moniker Deadmau5, who wears an illuminated mouse-helmet while performing on one of the most technologically advanced stages in the industry. Deadmau5 is a ten-year veteran of the dance music scene and almost exclusively plays his own music, loathing the idea of being called a DJ. He is outspokenly critical of EDM's current popularity, but remains one of the most genuine and accessible artists in terms of direct fan interaction. Although playing fewer live dates and eschewing lucrative collaborations with pop stars, Deadmau5's brand is strong enough to make the Forbes top-ten "highest-paid DJs" list in consecutive years, earning an estimated $21 million in 2013 and $16 million in 2014.[18] His current popularity remains strong with headlining spots at 2015's Governor's Ball and Bonnaroo festivals.

Deadmau5 was born Joel Zimmerman in Niagara Falls, Ontario. As a child, he loved to take apart electronic gadgets, telling *Rolling Stone*, "Clocks, appliances, all that shit. I had a whole graveyard under my bed."[19] An early adopter of computers, he

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[18] "The World's Highest-Paid DJs 2013," Forbes, accessed March 9, 2105, http://www.forbes.com/pictures/eeel45eekje/5-deadmau5-21-million-4/. "The World's Highest-Paid DJs 2014," Forbes, accessed March 9, 2015. http://www.forbes.com/pictures/emdh45mifg/no-10-deadmau5-16-million-6/.

[19] Josh Eells, "The Rise of the Mau5," *Rolling Stone*, July 19, 2012, 48.

designed websites in high school during the infancy of the internet. Zimmerman began using the family computer to make electronic music, learning online as he went, "my exposure kind of began on the Internet, joining various communities, hearing what all these chip tune dudes in like Norway were doing."[20] He joined the rave community and moved to Toronto by his late teens, making ends meet through web design, computer programming, and working as a producer/engineer in a local recording studio. Zimmerman veered toward original music production by working on sample libraries and audio software for Fruity Loops, an early digital audio workstation.

After finding an electrocuted mouse in his computer, Zimmerman began going by the moniker Deadmau5, or "dead mouse," on online discussion boards. The spelling is derived from 1337, or "leet," a version of the alphabet that substitutes characters from the American Standard Code of Information Interchange (ASCII) originally used in message boards among early hacker communities. The symbolic speech has recently become part of the lexicon of internet memes and especially in online gaming, where it connotes a level of skill or ability to dominate, or "pwn," a novice player called a n00b.[21] The incorporation of computer characters into stage names is a common practice of electronic

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[20] Tony Ware, "Deadmau5," *Electronic Musician*, Jan 2013, 22.

[21] 1337, or leet, equates to elite, or having a high level of knowledge and skill. Pwn is a stand-in for "own," or throughly beaten. N00b denotes a "newbie," a novice or unskilled player who is easily beaten. These words are generally used in online gaming circles. In early hacking communities, the word H4xz0r stood in for hacker, while warez signified cracked or pirated software. Deadmau5 continually draws from this type of computer-savvy language for various purposes including the the cycle of live performances named the Meowingtons Hax Tour.

musicians, as Reynolds notes: “with the use of depersonalized, technical-sounding, or numeric names, this intensifies the music’s posthuman aura, its abstract, disembodied quality.”[22] As in the case with Deadmau5, what was once a point of anonymity appears to have become a celebrity public persona, particularly through online social media. These characters act as avatars, superhuman personas that justify the level of adoration and perceived wealth that accompany high-level producers.

Deadmau5 is best thought of as a phenomenon of digital online culture. Physically, he resembles his namesake, a shut-in, frail computer geek who would rather waste away hours online than suffering through real-life social interactions. It is an ironic demeanor for someone at the top of the current party scene. His body is covered in tattoos drawn from classic video games, including Zelda life hearts, a ghost from Super Mario Bros., and a large Space Invader on his neck. His best friends are his two cats, Meowingtons and Nyancat. Cats enjoy unusual popularity on the internet as comedy-driven viral memes. Meowingtons often becomes the butt of Deadmau5’s jokes and countless pictures and gifs are uploaded for the amusement of his audience. Meowingtons even has his own twitter account, in which the anthropomorphized cat shares his thoughts online, often at the expense of his owner.[23] Nyancat was named for a popular animated cartoon of a cat, fused with a Poptart, flying through the sky while

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[22] Reynolds, 509.

[23] Prof. Meowingtons' Twitter page, accessed March 9, 2015, https://twitter.com/meowingtons_phd.

leaving a rainbow trail.[24] The animation is just the right combination of catchy, annoying, and ridiculous that propels a random online posting into a viral sensation. Deadmau5 even went as far as to wrap his Ferrari 458 with a custom skin of the Nyan Cat graphics. He playfully dubbed this transformation the "Purrari" and took the car on a global street race known as the Gumball 3000.[25] Given his personality, it is fitting that he would turn a symbol of status, a high-end luxury car, into an absurd homage to an internet phenomenon.

Rolling Stone interviewer Jonah Weiner described him as not anti-social, but "post-social: While he crafts his tunes in solitary confinement, he likes to AIM with his mom, text with Evans [former girlfriend], update his Facebook status, videotape himself and Professor Meowingtons horsing around, and post the clips to YouTube."[26] His acerbic wit and frequent rants on Twitter and popular blog, Tumblr, make headline news on music websites that fuel Deadmau5's verbal battles with other musicians, media, and anyone else who will draw his ire. Deadmau5's candid attitude endears him to his audience, nicknamed the horde, who view his unfiltered online behavior as more authentic than his commercial counterparts. He comes across as extremely generous with

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[24] The meme originated as an animated gif that was later put to music in a music video. As of March 9, 2015, the video has been viewed 118,488,860 times. "Nyan Cat [original]," YouTube video, posted by "slobs," April 5, 2011, https://www.youtube.com/watch?v=QH2-TGUlwu4.

[25] "Spirit of Gumball," Youtube video, posted by "mau5trap," Jan 15, 2015, https://www.youtube.com/watch?v=WDuRGF6pJLw.

[26] Jonah Weiner, "From Deadmau5 to Your House," *Rolling Stone*, Feb 17, 2011, 49.

fans, often directly answering questions and tweets, sharing music and live video streaming from his home with an unprecedented level of interaction.

Deadmau5's online reach is impressive with 9,502,606 followers on Facebook, 3.1 million followers on Twitter, 1.2 million followers on Instagram, and 1,099,369 followers on Spotify.[27] His most popular song, "Ghosts 'n' Stuff," has received 34,959,154 plays on Spotify and 34,321,190 views of the official video on YouTube.[28] A second major hit, "Strobe," has 37,136,732 plays on Spotify, and 28,612,424 views on YouTube.[29] The power of his online audience is not lost on Deadmau5, who shrewdly knows that his strong social media influence guarantees his music and artistic vision remain tightly controlled, similar to how Trent Reznor used Nine Inch Nails' popularity to dictate his own career path. In exchange, Deadmau5 creatively comes up with ideas of engaging his audience while strengthening his brand.

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[27] Deadmau5's Facebook page, accessed March 9, 2015, https://www.facebook.com/deadmau5. Deadmau5's Twitter page, accessed March 9, 2015, https://twitter.com/deadmau5. Deadmau5's Instagram page, accessed March 9, 2015, https://instagram.com/deadmau5/. Deadmau5's Spotify page, accessed March 9, 2015, https://play.spotify.com/artist/2CIMQHirSU0MQqyYHq0eOx?play=true&utm_source=open.spotify.com&utm_medium=open. Statistical information current as of March 5, 2015.

[28] "deadmau5 feat. Rob Swire - Ghosts N Stuff," Youtube video, posted by "Ultra Music," Aug 9, 2009, https://www.youtube.com/watch?v=h7ArUgxtlJs&spfreload=10. Statistical information current as of March 5, 2015.

[29] "deadmau5 - Strobe," Youtube video, posted by "Ultra Music," Sept 3, 2009, https://www.youtube.com/watch?v=tKi9Z-f6qX4&spfreload=10. Statistical information current as of March 5, 2015.

The best example is his 2013 launch of live.deadmau5.com, an online fan community that is wholly independent and uniquely direct in artist to fan interaction. For a monthly or yearly subscription, fans of Deadmau5 receive access to an array of exclusive content. This includes posts from Deadmau5, a video and picture archive and over a hundred exclusive songs available for high-quality stream and download. The social dimension is particularly impressive as a model of online fan culture possibilities. It hosts a message board where fans can interact, receive news and updates, and link to other interests. Deadmau5 will also frequently join the website's online chat room and engage in casual conversation with fans while he is making music or just spending time online. The final feature is live streaming video where Deadmau5 runs a high quality audio and video feed while producing tracks, performing live sets, and sometimes just playing video games all while communicating with fans in real time through the chat room.

Deadmau5's livestreams give a rare, insider perspective on modern music-making. Typically, Deadmau5 sits behind his workstation in front of three computer monitors and two massive Genelec reference speakers, clicking away on a mouse while chain-smoking and drinking a Tim Horton's XL double double coffee. If the sound is muted, it would be just as easy to think he was still web designing or writing code, rather than composing a song. He works in short loops, meticulously building a rhythm of layered kicks, claps, and hi-hats in the 4/4 House beat. After each sound has been tweaked until workable, harmonic elements are added. Rather than play an instrument,

Deadmau5 often just keys the notes into the software's piano roll with his mouse. These data function as MIDI commands for a number of virtual instruments that he rapidly cycles through until he arrives at a timbral sound that inspires further fine-tuning. Virtual knobs are raised or lowered to modulate the sound, arpeggiators stretch the fundamental note into a harmonic series, spectral EQ's are shaped, different effect plugins add delay or a bit of distortion until the sound begins to take shape. The loop continues endlessly as Deadmau5 adds or subtracts pieces to the mix until he arrives at a usable idea or decides to move on. The next step involves starting a new short loop, as songs evolve over marathon sessions of clicking away at the computer screens.

Sometimes, Deadmau5 fires up his massive racks of analog synthesizer modules, commissioned from Modcan founder Bruce Duncan. He endlessly twists knobs and patches cables while the computer records all the tiny variations. The hope is that the analog equipment will create spontaneous moments of sound that can be cut-up into samples to be further processed and reassembled within his DAW. Occasionally, Deadmau5 pulls out a more familiar instrument such as a Minimoog Voyager, an electric bass guitar, or a prized Steinway piano, which he has customized to send MIDI-out commands to his computer.

Eventually these short musical phrases coalesce into longer songs. The drama evolves from the building and stripping of layers until a new motif is juxtaposed against

the previous. Deadmau5 sets back to work within his DAW, assembling his samples and running the bits of audio and MIDI data through effects software.[30]

MIDI lies behind the explosion of virtual studio technology, or VST, which allows the input data to control software-based synthesizers and effects plugins.[31] Deadmau5 has even moved into the arena of third-party virtual instrument and plugin development with longtime collaborator Steve Duda. Duda is also an accomplished musician, engineer, and software programmer, who helped with the engineering of Nine Inch Nails' *The Fragile*. The two started Xfer Records in 2005 as an independent label for their collaborative projects, including music and VST/AU software instruments. Xfer

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[30] Deadmau5 typically uses two DAWs, Ableton and Cubase, for different purposes. Cubase is one of the oldest DAWs, originally produced by Steinberg in 1989. It functions as a standard recording, editing and mixing program. Ableton Live is a modern style DAW that attempts to meet the new needs of producers who are also performers. It provides all the capabilities of recording, editing, mixing and mastering, while also behaving as an instrument and sequencer in a live setting. It performs this dual role by incorporating popular elements of DJ'ing into the software, such as crossfading and automatic beatmatching. Ableton splits each song into two alternate views, session and arrangement. In arrangement view, a song is typically recorded, edited and different functions are automated as in a traditional DAW. Session view is useful for performance as it groups parts of a song into distinct scenes featuring the audio clips. the user can choose to run the entire scene or certain group of the audio through the computer or MIDI compatible hardware that feature trigger pads for different clips.

[31] VST integrates with most DAW software and are the computer equivalent of instruments and signal processors, run as virtual models of existing hardware or completely new inventions for the digital era of music making. VST also allows a flow of third-party software engineers to produce virtual instruments and effects with their own unique graphical interface that can be added and controlled to audio running in the host DAW program. Apple has an alternate plugin architecture known as Audio Units, or AU, and most virtual instruments and plugins come in both versions depending on the user's operating system.

currently has four software products available for sale, including a chord and arpeggiator creator named Cthulu, an LFO Tool, the software-based drum machine Nerve, and an advanced wavetable synthesizer named Serum. Each piece of custom software is programmed by Duda and features prominently in Deadmau5's music creation. During livestream sessions, Deadmau5 will often employ this specific software in the making of a track.

Thought the production of a track, Deadmau5 painstakingly mixes and masters his own material, a step that is usually handled by engineers rather than the recording artist. He aims for meticulously transparent recordings: "Something that is very clear. Where you hear every nuance in the way that it is mixed. Transparency applies to engineering, the placement of certain sounds, the honing in on and the lessening of frequencies. And mastering, which is really an art. A lot of guys don't do their own… I master as I make it, so it's a really difficult thing."[32] In the end, Deadmau5 has individually assumed all the different roles of translating a song idea into a finished recording. He functions as composer, musician, engineer, mixer, and masterer.

Since Deadmau5 creates his music in a personal home studio, fans are often watching along as their favorite tracks are produced, even commenting and providing feedback in real time. Access to live.deadmau5.com is available through the website, but also through mobile apps allowing for anytime connection to the Deadmau5 online

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[32] Todd Burns, "Deadmau5: It's Complicated," *Resident Advisor*, Sept 30, 2008, http://www.residentadvisor.net/feature.aspx?972.

community. It is a rare glimpse into the everyday life of a working musician and gives the fan an inside view of his compositional process as well as an online space to hangout and share interests. This closeness between artist and fan provides a greater motivation to support the artist, buy merchandise, and attend shows. Through the establishment of an internet community, fans feel personally involved in the music.

Deadmau5's online presence helped the artist become one of the strongest independent brands in popular music, reinforced by his cartoonish mau5head logo and helmet. The design of the mau5head logo resulted from early experiments with 3-D graphics-rendering software and appears in some variation on most of Deadmau5's official releases. Deadmau5 constructed the original red mau5head helmet to wear as a visual prop while performing, preserving his anonymity while giving the audience a focal point. Over the years, the helmet has evolved through multiple permutations and advancements. The current mau5heads are functioning cybertronic helmets, including their own air conditioning system and multiple internal screens so that Deadmaus can better view his performance equipment. New heads are commissioned from Jim Henson's Creature Shop and feature intricate LED technology that can project computer-designed images and animations on the exterior of the lightweight carbon fiber helmet.[33] Fans express their own creativity by making their own mau5heads and wearing them to performances. Online websites even feature detailed instructions and suggestions for

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[33] "Deadmau5 Headpiece Fabrication," Jim Henson's Creature Shop, accessed March 9, 2015, http://creatureshop.com/projects/test-hero-puppet-jack/.

building a mau5head as a fun, do-it-yourself project, furthering the connection felt between artist and fan as a music community.

The mau5head is an important part of his business, "It's McDonald's… No one's got a brand that strong."[34] Building a unique fan experience, culminating in live.deadmau5.com, goes beyond most of his peers' traditional marketing promotion and shows how Deadmau5 encourages an immersive online community surrounding his music. He explained his rationale behind promotion through his Tumblr blog, "you need a few things to cement yourself 'in'… Of course you'll have your twitter account, Facebook, tumblr, etc etc… so you have all these little conduits at your disposal to reach out to your followers, whether its 10 friends, 100 fans, or a fucking epic 1 million plus cult following." Here, Deadmau5 places a primacy on the tools of social media to allow access and interaction that will make fans feel included in the virtual space that will translate into real events. He goes on to outline three major considerations to create an engaging virtual experience, "1. You need to make a world… 2. Don't overkill 900 on the promotional shit… 3. You are not fictitious." On the third point he elaborates the need for the artist to interact at a personal level, "From what I've learned, the best way to make a guest in your theme park feel involved or just as much a part of your world as you

[34] Eells, 52.

are is to avoid being invisible. Get out there and immerse yourself in the world you created, you'll have fun."[35]

Deadmau5's image, cultivated over ten years of official releases, fan interaction, and live performances, is one of the most recognizable signatures in current popular music, but it does bear a resemblance to another famous cartoon mouse. He joked about the similarity to *Rolling Stone* in 2012, saying, "Someone at the Disney patent office fell asleep on that one."[36] Although the two coexisted peacefully, a legal dispute erupted when Deadmau5 attempted to register his trademark with the United States patent and trademark office in June 2013. The mau5head logo is already a registered trademark in most of the world, but Disney filed a lengthy opposition in 2014. Deadmau5 promptly tweeted, "landed home to some interesting news: looks like Disney officially just filed in opposition of my trademark… lawyer up micky."[37] He followed up with a cease and desist letter to Disney over a cartoon on their website featuring "Ghosts 'n' Stuff."[38] In a statement to *Rolling Stone*, his lawyer, Dina LaPolt addressed the legal dispute by saying, "Our client will not be bullied by Disney and is prepared to fight to protect his rights to

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[35] Deadmau5, "some advice on rollercoasters and shit," Tumblr, accessed March 9, 2015, http://deadmau5.tumblr.com/post/23238420396/some-advice-on-rollercoasters-and-shit. I have preserved Deadmau5's spelling and punctuation when quoting his blogs or tweets.

[36] Eells, 52.

[37] Deadmau5, "6:02 PM - 2 Sept 2014," Twitter, Sept 2, 2014, https://twitter.com/deadmau5/status/506970529321201664.

[38] "Ghosts 'n' Stuff - Re-Micks," Disney video, accessed March 9, 2014, http://video.disney.com/watch/ghosts-n-stuff-re-micks-4cc34ca4636bec7bd7bd38a3.

his property."[39] Although the issue remains unresolved, whether or not the mau5head is too close to Mickey Mouse is a valid legal question and carries financial repercussions in terms of merchandising and imaging options in the future. Deadmau5's original confession of the similarities point toward his likeness as not entirely original, but yet strong enough of a branding to differentiate between the two entities. It may be better to consider Deadmau5 as a remix of the mouse image, an integral part of electronic music's past that faces the same challenge of originality versus derivation.

In this reading, Deadmau5 represents a dystopian version of the iconic childhood character. Like most electronic music, his tracks use intense rhythmic buildups that result in euphoric elation or nightmarish distortions. He can just as easily tap into feelings of nostalgia, security, and innocence of an audience raised on Disney, or subvert the image of the playful mouse and its representations of naivety and commercialism. These themes are reflected in the animations that accompany his live performance. Playful digital cartoons show Minecraft's pigs, cameos of an animated Meowingtons or monstrous versions of H.P. Lovecraft's monster Cthulu. His mau5head can turn from a glowing smile to jagged teeth and red eyes on musical cue, shifting tone along with the emotions of his audience. His mau5cube stage setup is also equipped with LED technology that moves in time with the music, transforming the stage into a giant computer screen for the thousands in attendance. Deadmau5 stands in the middle of the

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[39] Kory Grow, "Deadmau5 Sends Cease and Desist to Disney Over 'Infringing Video'," *Rolling Stone*, Sept 5 , 2014, http://www.rollingstone.com/music/news/deadmau5-cease-desist-disney-20140905.

video frenzy, inciting feelings of childlike glee and fear, building to a final moment of euphoria by the end of his set.

The new era of EDM artists wield superhuman power over the audience and are celebrated as a virtual shaman during the large-scale communal festival. The performances must be equally larger than life, employing a multimedia barrage to satisfy the entertainment expectations of online audiences gathered around the large screens. The music and visuals are extensively preprogrammed via SMPTE timecode metadata that triggers visual sequences at set points of the music. Thus, the music and video stay largely synchronized through computerized automation. The end result being that an impressive EDM show is about atmosphere, not real time music production, which is impossible in this scenario. Deadmau5 credits the fans for EDM's live success, "you know what makes the EDM show the crazy amazing show that it is? you guys do, the fans, the people who came to appreciate the music, the lights, all the other people who came, we just facilitate the means and the pretty lights."[40] While his sentiments reflect older notions of the communal dance floor, audiences involved in current EDM appear to be moving in an opposite direction, building a cult of celebrity around certain artists.

The frenetic visuals of the EDM show mesmerize Deadmau5's audience of young Millennials. This new generation has adopted the sounds of electronic instruments as the normal sound of music, an acceptance of the noise that proved antithetical to previous

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[40] Deadmau5, "we all hit play.," Tumblr, accessed March 9, 2015, http://deadmau5.tumblr.com/post/25690507284/we-all-hit-play.

generations. and without the need to defend it aesthetically from acoustically- or human-produced sounds. They grew up online; a connected life is reality and their music is a reflection of growing up in a digital age. Deadmau5's stage persona and online avatar also show the emergence of a third, virtual self, in the digital age, to accompany the public and private self. This virtual self, and the space it occupies in the online world, requires negotiation in daily social exchanges as a technologically driven part of human existence. Deadmau5's natural interest in technology, gaming, and computers may have marginalized him in the past. Today, however, it connects him to a youth culture that mediates life through the smartphone.

His art taps into the inner struggle between narcissistic entitlement, social anxiety, and superhuman expectations projected on the Millennials as they enter adulthood. His music, coupled with the audience's amphetamine-fueled MDMA and Adderall drug culture, produce bodily responses that echo the high-paced, multitasking young mind. Although sober, Deadmau5 does not openly discourage the use of drugs among EDM audiences. He fears the celebration of the drug and party culture is overly glorified without enough attention to serious health risks and could negatively impact the scene.[41]

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[41] Zimmerman does not use drugs or drink for two mentioned reasons: one, he suffers from neurocardiogenic syncope, a medical condition that would make drug use especially dangerous; and two, he has stated that he does not enjoy feeling out of control. Maintaining a stance against the drug abuse in the culture led to an online verbal fight with Madonna, who Zimmerman felt glorified MDMA, or ecstasy, during the Ultra Music Festival in Miami. For more information see Tumblr post: Deadmau5, "Responsibility," Tumblr, accessed March 9, 2015, http://deadmau5.tumblr.com/post/19950981116/responsibility.

Dance music facilitates an escape from the pressures of everyday life. Disco and House emanated from nightclubs in gritty, working- to lower-class districts of New York and Chicago where minority audiences could participate in the fabricated opulence of the club that was denied to them during the day. The scene was an underground phenomenon, existing outside of mainstream culture and only crossing over for brief stints before being banished again to the other side of town on the grounds that the music was vapid, inauthentic, or unworthy in artistic merit. Rave culture existed beyond the boundaries of society, a subversive underground that challenged legality through its performances and drug culture. Rave culture also promoted an ideology of peace, love unity, and respect among participants on the inside. Present EDM culture, centered in the adult party capitals of Las Vegas and Miami, eschews most of the previous democratizing points of dance music culture. Instead, the fantasies of Las Vegas and Miami push symbolic wealth and exclusivity. Attending a live event by a celebrity DJ while sitting in the VIP section of a hot nightclub implies an elevated level of social status that can be shared with others in your network on social media. Large-scale festival audiences behave somewhat differently given the mass of people, however, it could serve as an entry point to EDM culture for younger audiences who do not meet the age, financial or social status requirements to participate in the private club parties. By becoming fans of the right entertainers and glorifying their jet-set lifestyle, these younger audiences project the desire to join the exclusive club, believing their education will in turn lead to wealth

that can be translated into achieving the symbolic status of the celebrity DJ, who they are currently idolizing.

EDM music functions by playing on this sense of delayed gratification. The music builds tension for climatic moments, known as drops, where stripped elements from the bass line to the kick drum reenter the mix, driving the crowd into a momentary period of rhythmic euphoria. The DJ consciously begins removing the predominant rhythm parts, rebuilding and looping the song stems until the next drop lifts the crowd to a presumably higher pinnacle. The skill of the the modern DJ is their ability to seamlessly build anticipation and release points over a set that can stretch past an hour in duration. Since much of the live set is preprogrammed, the performative aspect goes little beyond turning the strong rhythmic parts on and off at key moments of playback. The DJ often mimes other performative acts on stage to give an appearance that something more complicated is occurring, although little more than a touch of equalization or filtering is applied to the programmed sound mix.

Saturday Night Live parodied the EDM performance in a digital short that featured a club performance of the fictional Davvincii, a play on Swedish celebrity DJ Avicii, in which his performance consisted of taunting the audience by hovering over a large red button labeled "Bass." The button itself is another pop culture reference to the red "Easy" button featured in the advertisements of office supplies megastore, Staples. The lyrics of the electronic track repeatedly loop, "When will the bass drop?," as Davvincii plays computer games, makes breakfast, turns a single knob to apply a filter,

and returns to a game of Jenga on his stage table, all while pointing at the crowd and pretending to move toward the big, red button. Only after promoters enter from the side stage with bags of money and audience members begin handing Davvincii cash, jewelry and credit cards does the DJ push the red button, unleashing the bass. The audience goes wild with the release of tension, popular producer Lil' Jon makes a cameo appearance encouraging the crowd to, "get turned up to death," as heads begin exploding into showers of blood and gore. Davvincii rises into the air as green lasers shoot from his eyes over the crowd.[42] The skit comedically points out some of the absurdities of EDM culture. However, some within the scene, including Deadmau5, feel the joke of the big red "Bass" button is not far from reality.

In an attempt to lift back the curtain on EDM performance, Deadmau5 posted one of his more divisive critiques of the genre. He writes:

> we all hit play. its no secret. when it comes to 'live' performance of EDM… that's about the most it seems you can do anyway. It's not about performance art, it's not about talent either (really its not) In fact, let me do you and the rest of the EDM world button pushers who fuckin hate me for telling you how it is, a favor and let you all know how it is.[43]

Computer-based EDM is restrained in similar ways as the previously discussed *musique concrète* or the San Francisco Tape Music Center. The origin of the Buchla synthesizer, in the case of the Tape Music Center, was partly to address an uninspiring live

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[42] Saturday Night Live, "SNL Digital Short: When Will The Bass Drop?," NBC.com, accessed March 9, 2015, http://www.nbc.com/saturday-night-live/video/digital-short-when-will-the-bass-drop/2783137.

[43] Deadmau5, "we all hit play.".

performance when a pre-edited tape was played to an audience that expected music to come from musicians playing instruments. EDM addresses this tension through the visual spectacle, but, as Deadmau5 reveals, the complicated automation and syncing that goes into making the music ultimately limits the performance options to basically pressing play.

In an interview with *The Guardian*, he intimated, "they say, the rat is the first one to jump off the boat when it starts going down, and that's kind of what's happening. It's already been going down the last couple of years, for me. Maybe not in the industry."[44] By entering the mainstream through pop music and drawing massive crowds for live performances, DJ culture appears to have overcome the stigma of inauthenticity that denigrated disco's worth in comparison to the perceived authenticity of folk or rock. However, automated technology raises a serious issue about musicianship in EDM and the authenticity of performance. Deadmau5 views the current state of dance music as overly commercialized, uninspired, and on the verge of collapse. Through Twitter and other social media outlets, he criticizes performers who simply "push play" and allow the visual spectacle to do all the work while they mime a DJ performance. As Deadmau5 suggests, "If I wanted, I could play a fucking .wav file and just stand there and fist-pump

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[44] David Smyth, "Deadmau5 interview: 'Festivals are being branded bigger than the acts, it's totally backwards'," *The Guardian*, June 13, 2014, http://www.standard.co.uk/goingout/music/deadmau5-interview-festivals-are-being-branded-bigger-than-the-acts-its-totally-backwards-9534366.html.

all night, and no one would give a shit."[45] These sentiments are echoed by other artists, including DJ Sneak, "You don't want some clown up there smoking cigarettes, taking pictures, not wearing headphones, not working equipment—sometimes it's not even plugged in. It's Spinal Tap."[46] One of the fastest ways to incite Deadmau5's infamous bad temper is to call him a DJ, instead of a music producer. Continuing on his blog post, he writes:

> my 'skills' and other PRODUCERS skills shine where it needs to shine… in the goddamned studio, and on the fucking releases, thats what counts… because this whole big 'edm' is taking over fad, I'm not going to let it go thinking that people assume theres a guy on a laptop up there producing new original tracks on the fly. because none of the 'top dj's in the world' to my knowledge have. myself included.[47]

The production of the track is where the actual work of making music occurs. In this arena, Deadmau5 is particularly skilled and borderline obsessive toward detail. The live performance instead becomes a showcase for the produced songs on a large sound system for a gathered audience.

Deadmau5 has used synthesizers and computers to make music from the beginning. He started on the Roland MC-303, one of the first all-in-one grooveboxes that combined basic synthesis with a sequencer for pattern-based composing, "That got my head around oscillators, filters, your meat-and-potatoes-of-dance-music kind of stuff."[48]

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[45] Eells, 48.

[46] Steve Knopper, "What Are DJs Doing Up There?," *Rolling Stone*, July 19, 2012, 54.

[47] Deadmau5, "we all hit play."

[48] Ware, 22.

Soon, he was using the family computer to create digital chiptunes in Impulse Tracker, a DOS program that allowed multitrack sequencing.[49] His first official release, *Get Scraped* (2005), ranged in electronic styles from the chiptune "8bit" to more ambient, downtempo explorations. 2006's *Vexillology* showed Deadmau5 settling into the Progressive House genre, the category of dance music that largely defines his style. Progressive House features a more experimental production style than conventional House dance music engineered for the club. Songs are often long, containing multiple movements or phrases, similar to how progressive rock extended the form of the conventional rock song for sonic exploration and dramatic effect. Rhythms generally follow the steady 4/4 House beat and fall at a quick tempo of 120-130 beats per minute. Layers build up and breakdown over the course of a song, which can easily reach lengths between eight and ten minutes. Some of Deadmau5's music may also fall into the category of Electro-House, another subgenre of House music with heavier bass, including added sub frequencies, minimal percussion, and standout lead synth lines.

In 2007, Deadmau5 formed his own record label, mau5trap, and released *Random Album Title* (2008) in partnership with Ultra Music, a New York based EDM record label. Three singles reached number one on the US *Billboard* dance chart, representing

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[49] Chiptunes were created using the integrated sound-producing circuits of early computers and video games. They feature a lo-fi, 8-bit digital sound.

Deadmau5's breakthrough into the mainstream.[50] *For Lack of a Better Name* (2009) featured two of Deadmau5's biggest hits, "Ghosts 'n' Stuff" and "Strobe," each showcasing a different aspect of Deadmau5's production style. "Ghosts 'n' Stuff" is a concise Electro-House track, drawing on classical piano influences and a spooky sample taken from the science-fiction film, *The Brain from Planet Arous* (1957). "Strobe" is a smooth, instrumental Progressive House track, along with some trance elements that typically closes Deadmau5's live setlist by building toward the final euphoric release of the night. The album version is just over ten minutes in length, however, Deadmau5 has extended the song as long as twenty minutes in performances.

The two hits paved the way for Deadmau5 to crossover from the dance charts into mainstream pop music. His following three albums, *4x4=12* (2010), *> Album Title Goes Here <* (2012), and *while(1<2)* (2014), have charted on both the *Billboard* dance and pop charts, with his most recent albums reaching number one on the dance chart and entering the top ten of the pop chart. However, the popular attention and success appears to have only made Deadmau5 more disgruntled and combative with popular music. His music has increasingly moved away from the smooth builds of Progressive House into other, harder-edged territories such as dubstep. Although he primarily produced club-ready dance tracks in the past, his current material is more dystopian and critical, engaging in the use of distortion as a form of noise politics.

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[50] "I Remember" and "Move for Me" were collaborations with San Franciscan producer Kaskade. "Ghosts 'n' Stuff," a collaboration with Australian producer Rob Swire, was released as a single between albums.

"Raise Your Weapon," the last single released from *4x4=12*, is an eight-minute epic, featuring sonic elements both in Deadmau5's typical style and stretching into harder EDM genres. The entire first half of the track features the characteristic building and stripping of layers of Progressive House music, opening with a wash of sound leading into a sparse, melancholic piano introduction. An echoed female voice sings over the piano accompaniment about having her heart ripped apart as if she was at war with her lover, "Raise your weapon, one word and it's over / Ripping through like a missile / Ripping through my heart / Rob me of this love / Raise your weapon."[51] A pulsing synthesizer swells to join the mix roughly a minute in, while Deadmau5 holds back the rhythmic elements, building tension before releasing the kick drum ninety seconds into the track. The piano, pulsing synthesizer, and kick drum continue into another wash until more layers of synthesizer and percussion are added, including hi hats on the offbeats and the return of the vocals through another cycle of the lyrics. The elements continue to build, adding synthesizer layers, filtered crescendos of metallic timbre and touches of percussion until they are abruptly dropped and just the vocal sits over the sparse piano.

After a second wash of sound, the track veers off unexpectedly into the jagged glitches and wobble bass lines of another popular EDM genre, dubstep. The move toward dubstep is a rare occurrence in Deadmau5's music, however it lends a discordant violence to a song about the destruction of the heart. The writing credits list Sonny Moore, known by his stage name Skrillex, a popular dubstep artist who Deadmau5 aided

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[51] Deadmau5, "Raise Your Weapon," *4x4=12,* Ultra Records UL 2518-1, 2010.

early in Moore's career, releasing an EP through mau5trap. Dubstep is a more aggressive form of EDM that relies on heavy syncopation and sub-bass frequencies that disrupt the relative smoothness of House. It is darker in tone and the timbre is soaked in bass-heavy distortion. The sudden shift between Progressive House and dubstep creates a jarring, but musically applicable conclusion as the track itself rips apart through the introduction of noise.

Deadmau5 performed the dubstep breakdown at 2012's Grammy awards in a collaborative performance with the Foo Fighters, a rock band led by former Nirvana drummer (but now guitarist) Dave Grohl. Deadmau5 remixed the Foo Fighters' song, "Rope," earlier in the year and the mashup of traditional rock with electronic music indicated a recognition of EDM's mainstream crossover by the industry. The Foo Fighters performed the song, segueing into Deadmau5 playing the remix from behind his mau5cube. He deftly mixed the track into "Raise Your Weapon," as the crowd physically responded to the release of tension and overt assault of the music, proving that EDM's sonic impact could stand on par with raucous electric guitar. The visual elements of the stage added ambient lighting effects changing from blues and greens to strobing reds as his LED-equipped mau5head took on maniacal faces that accompany the more dystopian elements of the dubstep breakdown.[52]

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[52] "deadmau5 - Raise Your Weapon (54th GRAMMYs on CBS)," Youtube video, posted by "deadmau5VEVO," Feb 17, 2012, https://www.youtube.com/watch?v=RZ6PZ3iBbMc.

When the song is played live, fans raise their hand into the air making a pointed gun with their thumb and forefingers, often at the behest of Deadmau5 from the stage. On the surface, the lyrics reflect emotional pain over a particularly harsh breakup. The act of the audience raising their hands reflects a strength in numbers against forces of oppression or pain. This performative act is one of the more communal moments of his live sets, as countless audience members respond as one with a gesture of defiance pointed toward the sky, suggesting the potential of community activism that echoes the unity espoused by the dance floor in earlier electronic music cultures.

In 2013, the chorus of "Raise Your Weapon" was sampled for a socially-conscious hip-hop track by Ohio-based emcee Stalley. The rap lyrics elaborate on his emotional angst in response to enduring racism as a Black Muslim man in America. Stalley represents the growing discontent of those in his community, "Yeah, I'm upset yo / Cause you won't accept the people that I rep for / The kids with broken hearts and torn souls that find it hard to let go / Confusing them with your religions / And lying politicians, throwing us in your prisons / Making us welfare recipients with no hope, so why hope?" The hip-hop version is filled with politically charged cultural commentary that uses "Raise Your Weapon" as a call to an enlivened militancy: "You bastards listen before it's a nation of millions I provoke / And we show up at your front door / Weapons raised, no questions man / You know what we come for / Respect of the utmost."[53] This new

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[53] Stalley, "Stalley - 'Raise Your Weapons' ," Youtube video, posted by "StalleyVid," Dec 6, 2013, https://www.youtube.com/watch?v=OpoW8NIMhWM.

context centered on minority discrimination demonstrates how remix culture can extend the social meaning of music. Remixing updates a song's message, while situating it within a creative continuity. In many ways, it acts as a digital folk music, allowing other artists to continue the cultural discussion, add unique parts, change meaning, or maintain the music's vitality.

The lyrical content can also be read as a political antiwar statement, given its release during an ongoing War on Terror. In this reading, the song reflects a weariness and discontent toward American operations in Iraq and Afghanistan carried through the George W. Bush and Barack Obama presidencies. Lyrics such as, "Sign away our peace for your war . One word and it's over / Dropping your bombs now / On all we've built / How does it feel now / To watch it burn, burn, burn / Raise your weapon, raise your weapon, and it's over."[54] The verse is striking given its musical placement during the distorted sound and rhythms of the dubstep genre. It functions as a digital version of Hendrix's ravaged "Star Spangled Banner," along the same lines as Nine Inch Nails' criticism of the Bush-era War on Terror in "The Hand That Feeds." "Raise Your Weapon" begins to reflect the apprehension of a younger generation that has not seen a sustained period of peace, now or in the foreseeable future. It expresses a mistrust of political intentions and a mounting anxiety that an ideological battle against terrorism will equate with an oppressive surveillance state, manifested in the debate over online whistleblower Edward Snowden and the United States National Security Agency leaks.

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[54] Deadmau5, "Raise Your Weapon."

Deadmau5 picks up on themes Trent Reznor began exploring in the mid 2000s, culminating in the dystopian Nine Inch Nails' album *Year Zero*.

Deadmau5 went on to remix Reznor's *Year Zero* track "Survivalism." As discussed in the previous chapter, "Survivalism" presented Reznor's sharpest critique of the dangers of governmental surveillance within the noise politics of the industrial genre. Deadmau5's rework further digitizes the processed sound of the original. He keeps the lyrics, but strips much of the electronic instrumentation that Reznor used in the track. Ironically, Deadmau5 slows the frenetic pulse of the original's rhythm, the opposite of what one may expect from an electronic House producer. Instead, "Survivalism" turns into an moody reinterpretation, evident on his first demo version posted to Soundcloud in 2012. He juxtaposes one section of ambient background noise, consisting of a simple drum machine pattern and sparse piano touches with loudly remixed stems of acoustic drums, electric bass, distorted guitar, and a sample of Reznor's vocal lyric, "I got Survivalism." Although Deadmau5 pulls mostly the traditional instrumentation into his version, he applies many postproduction effects to modulate the sound. Reznor's voice echoes and pans, while the drums boom with additional reverb.[55] The remix was ultimately important enough as a political statement for Deadmau5 that he chose to

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[55] Deadmau5, "Survivalism (deadmau5 remix instrumental)," Soundcloud, Feb 2012, [site discontinued].

expand his remix and include a final version on his official release *while(1<2)*.[56] In the album version, Deadmau5 continues to rework the song as a slower mood piece. Here, he brings in the full verse and chorus structure from the original song. For the verses, the ambient background noise and drum machine patterns remain, but the piano is dropped. The chorus enters with a blast of noise featuring the original stems, this time adding a drone of fuzz distortion to the mix. The most significant feature of the Deadmau5 remix is the digital distortion processing at various points, causing a harsh, dry timbre due to the nature of the clipping. While Nine Inch Nails' "Survivalism" energizes the resistance, the Deadmau5 version, coming seven years after the original, feels more like the ghostly remnants of failed revolution left cached on a computer.

Deadmau5 presents his own future dystopia in the track "Professional Griefers," a collaboration with singer Gerard Way of the pop punk band My Chemical Romance. The high-energy, Electro-House song begins with beeping and a wash of sound into distorted synthesizer stabs that are reminiscent of an electric guitar's power chords. The rhythm is a steady 4/4 beat with a kick drum on the downbeat and claps on the offbeat, featuring a sporadic irregularity on the fourth beat. The verse lyrics are shouted, double-tracked, and

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[56] Deadmau5, "Survivalism (deadmau5 remix)," *while(1<2),* Astralwerks/Mau5trap B002088402, 2014. "Survivalism (deadmau5 remix)" is one of two Reznor songs remixed and released by Deadmau5 on the double album. Side one features a remix of "Ice Age," a song from Reznor side project How to destroy angels_. The decision to feature two remixes of Reznor's material suggests that he is increasingly aligning his work with that of Reznor, of who Deadmau5 has been a longtime fan. It also steers Deadmau5 away from the escapist concerns of mainstream EDM that he often criticizes and toward a direction of noise politics and social commentary.

digitally effected, building tension until the release of the chorus. The chorus explodes into sparkling, synthesized arpeggios before returning to the aggressive distorted stabs of the verse. The opening lines echo the rush of the chaotic, mechanized music, "I like the sound of the broken pieces / I like the lights and the sirens she says / We got machines but the kids got Jesus / We like to move like we both don't need this." The lyrics go on to project a future where artificial intelligence and machines have begun a cybernetic destruction of organic humanity, "God can't hear you / They will fight you / Watch them build a friend just like you / Mourning sickness, XYZ / Teenage girls with ESP." The chorus, which breaks through the industrialized rhythms of the verse, asks for clarity to see past a culture of factory-line technological production, "Give me the sound, to see / Another world outside that's full of all the awful things that I made." The lyrics engage a tension between man and machine, suggesting the possibility of a violent future and expendable attitudes toward life if technology spirals ahead without human empathy: "Carbon-lacing / Spent shell-casings / Photographs that I'm erasing / Bonus lives with pixel-screams / Girls with guns on LSD." The final chorus changes the earlier lines, making humanity analogous to a plague that has ruined the natural world around it while remaining spiritually unfulfilled, "'Cause we are the last disease / Another broken life that's full of all the awful things that I made."[57]

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[57] Deadmau5, "Professional Griefers," > *Album Title Goes Here* <, Ultra Records UL 7841-2, 2012.

The accompanying video for "Professional Griefers" cost over a million dollars, making it one of the most expensive music videos ever produced. Most of the money went toward advanced computer-generated graphics, "What's cool is, the seven digits we're spending is mostly going into brand new render technology… inserting these 20-foot robots. The CG is gonna be in-fucking-sane."[58] The concept drew on the classic dystopian film *Mad Max* (1979), "This is UFC [Ultimate Fighting Championship] in the future… where Gerard and me are combating each other in this sort of *Mad Max* meets *Real Steel* way."[59] The desert landscape features a massive thunderdome surrounded by screaming fans. Deadmau5 and Way sit behind mau5cube command centers and battle each other by controlling giant mau5 robots. The frenzied crowd continues to go crazy at the violent spectacle. A news scroll at the bottom of the screen cycles fictional stories of the year 2038, including one interesting blurb that "Meowingtons corp issues massive recall on robotic cats due to faulty logic chip."[60] A computer-generated, robotic version of Deadmau5's cat, Meowingtons, prowls the scene and eventually sabotages the wiring of Way's command station. Deadmau5 is able to defeat Way in the cyber-battle, but the robotic Meowingtons also attacks his mau5robot causing the giant machine to come

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[58] Chris Martins, "Deadmau5 Unfiltered: Behind His 'Professional Briefers' Video," Spin.com, August 29, 2012, http://www.spin.com/articles/deadmau5-my-chemical-romance-gerard-way-professional-griefers-video/.

[59] Ibid.

[60] "deadmau5 ft. Gerard Way - Professional Griefers (Official Video)," Youtube video, posted by "Ultra Music," Aug 29, 2012, https://www.youtube.com/watch?v=Hr2Bc5qMhE4.

crashing down on the combatants and the audience. The screen reads "Disconnected" in red script as the robotic Mewoingtons stalks toward a fallen camera as the video glitches. He pounces towards the camera and the screen fills with static. Similar to films like the *Terminator* series, the dystopian scenario of "Professional Griefers" presents a extrapolation of casual video-game violence carried into reality within a technological future, causing a bloodthirsty self-detonation as faulty artificial intelligence leads to threatening sentient robots.

Another song featuring prominent dystopian, science-fiction themes, "The Veldt," also appears on > *Album Title Goes Here* <. The track is based on a short story by American fantasy author Ray Bradbury, whose work includes numerous science-fiction stories and the dystopian novel *Fahrenheit 451* (1953). Bradbury was a popular voice that helped mainstream fantasy and science-fiction in its golden era during the 1950s, as American imaginations were captivated by a technological future.

In Bradbury's short story, the Hadleys live in a hi-tech "Happy-life Home," which performs daily domestic tasks for them, such as cooking dinner, cleaning, even tying their shoes. Their children are captivated by a virtual reality nursery, which creates lifelike play-lands based on their thoughts. The Hadley's two children, Peter and Wendy, become fixated on the African veldt, a harsh landscape filled with preying lions and a blazing hot sun. The parents develop an anxiety that the nursery and the automated house are distorting reality with detrimental effects on the family. The utopian dream of an easy life catered by machines quickly turns into a dystopian nightmare. As the mother, Lydia

describes, “I feel like I don’t belong here. The house is wife and mother now and nursemaid. Can I compete with an African veldt? Can I give a bath and scrub the children as efficiently and quickly as the automatic scrub bath can?”[61] The father, George, consults a psychologist, who becomes concerned about the violent thoughts manifested in the veldt nursery and advocates that the family unplug from the house to return to normalcy. The children have become so reliant on the entertainment of their virtual space that the threat of unplugging turns them against their disciplinarian parents. They lure their parents into the veldt nursery and lock the door behind George and Lydia, instructing the room not to let their parents “switch off the nursery and the house.”[62] The virtual space crosses the boundary between imagination and reality as the lions murder and eat the children’s parents. Peter and Wendy resume happily playing in the nursery after the threat of disconnection, in the form of their parents, is removed.

After reading “The Veldt” in 2012, Deadmau5 became inspired to create a musical soundtrack for the story, “a somewhat melancholic yet uplifting audio image of kids bestowed with insane technology which enables them to conjure up any setting or any thing they desire… which in this case, as children sometimes wish their parents were dead by an unfounded retaliation to being disciplined.”[63] The themes resonated with the

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[61] Ray Bradbury, “The Veldt,” *The Illustrated Man* (New York: Simon & Schuster, 2012), 13.

[62] Bradbury, 26.

[63] Deadmau5, “Collaborations, Songwriting and the like,” Tumblr, accessed March 9, 2015, http://deadmau5.tumblr.com/post/19570452553/collaborations-songwritting-and-the-like.

musician who spends so much of his time online, creating a thematic world for his fans and him to enjoy. While there are benefits to a connected community, there should also be an impulse to examine the negatives of such a life, as in Bradbury's example. The dangers of getting lost in online life and becoming unaware of the dividing line between the virtual and real continue to be blurred in modern culture. Deadmau5 live streamed from his studio as he composed the track and began layering sampled African drums with spritely synthesizer lines. A short demo was uploaded to Soundcloud that featured an African-inspired rhythmic introduction segueing into a playful House song with short moments of slightly dissonant synthesizers to show that maybe all was not as it seemed in the world of the veldt.

Once Deadmau5 shared an instrumental demo of the work in progress to his Soundcloud page, a fan reached out to the artist over Twitter, linking Deadmau5 to his Soundcloud post of the track with an added original vocal. Singer Chris James, who had been watching the live stream, adapted Bradbury's short story into lyrics and recorded a vocal track over the demo. A characteristically pessimistic Deadmau5 clicked the link to hear James's version, deciding he would give it a shot. Upon hearing the vocal and lyrics, Deadmau5's mood turned to amazed elation. He swelled with excitement at what this fan had done and quickly contacted him directly through Twitter to begin a

collaboration on the project entirely fueled by the accessibility of social media.[64] Deadmau5 wrote about the exciting moment on his blog, saying, "the kid went and read the story, and did what i did. His verses are connected to me in that way, this track is pure. this is how inspiration is supposed to work."[65]

James was flown in to record with Deadmau5 and the two shared credit on the final song. "The Veldt" was released in multiple versions including a radio edit, a long edit containing the African drum introduction, the album version and remixes. The album version ended up as an eight-minute Progressive House track featuring James's lyrics and vocals. The words inserted scenes from the story, "Outside the lions run / Feeding on remains / We'll never leave / look at us now, so in love with the way we are," and its dystopian themes, "Every night, they rock us to sleep / Digital family / Is it real? Or is it a dream? / Can you believe in machines?"[66] Again, Deadmau5 praised James's contribution, "he righteously did his homework, and came up with just a few bang on verses that completely compliment the story and the mood, which is all i ever want from a song that contained lyrical content. Can't give him props enough."[67] An accompanying animated music video tied together the themes of the story and the song by featuring

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[64] Deadmau5's reaction during his livestream was video captured by a fan and uploaded to Youtube. It can be viewed at: "Deadmau5 finds the vocals for The Veldt March 20 2012," Youtube video, posted by "Wanza7," May 22, 2014, https://www.youtube.com/watch?v=jgeWHnSmPKE.

[65] Deadmau5, "Collaborations, Songwriting and the like."

[66] Deadmau5, "The Veldt," *> Album Title Goes Here <,* Ultra Records UL 7841-2, 2012.

[67] Deadmau5, "Collaborations, Songwriting and the like."

cartooned children playing in the nightmarish world of the veldt.[68] Through online social media and an encouragement of remix culture, the megastar producer and a talented fan came together to make an artistic work with a critical message. What began as a dystopian themed critique of virtual life ended as a positive manifestation of the Deadmau5's connected world.

Deadmau5 serves as an informative example of music intersecting with modern online culture and redefining the possibilities of both spaces. At its most critical, the noisy disjunctures warn of depersonalized escapism into the simulated world of technology, a trope that extends back to 1950s' science-fiction. The example of "The Veldt," however, demonstrates the potential for online life to be a collaborative and fulfilling space, unlike the violent manifestations of the children in the story. It reflects that online life is constantly in the form of the remix, sampling and rebuilding virtual existence in order to break through the tension to a point of communal elation. For the EDM-loving millennial generation, the sounds of technology promise that the drop will come, multitasking anxiety will be alleviated and the future will be brighter and more alive than their present reality.

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[68] "deadmau5 feat. Chris James - The Veldt (Music Video)," Youtube video, posted by "deadmau5," June 25, 2012, https://www.youtube.com/watch?v=_esYONwdKuw. The video ends with a dedication to Ray Bradbury, who died shortly before its release in 2012.

CONCLUSION

Electronic technology opens new analytical paths into music that differ from both score-based and field-work methodologies. This project arose largely from a need to overcome the limitations of the musical score, especially in genres that rely fundamentally on timbre and sound manipulation rather than on harmonic or melodic complexity. Even though contemporary musicians create music by sculpting sound through the interface of guitar pedals, effects, and working on short loops in a digital audio workstation, these techniques are the least studied part of the music-making process. It is fair to say that with few exceptions, technology shapes every stage of modern music, from creation, to its recording, modes of dissemination, performance, consumption, and playback. Furthermore, computer-based DAWs have redefined the practices of "composer" and "performer" within a production model that has increasingly become the norm in popular music. I propose that the utility of digital analytical techniques and multitrack audio, informed by music production models, are powerful tools for future studies of music, noise, and sound.

For this dissertation, I drew on my own interdisciplinary background to push toward new theoretical possibilities for analyzing music. I place the growing scholarship in sound studies within the context of American studies, taking sound as my point of departure—"thinking sonically," as Sterne proposes—while researching and formulating my own particular case studies. By arguing that the use of electronics in popular music

signifies a technologically-obsessed postwar American culture moving rapidly toward a digital revolution, I provide an alternative history of the online world, one that is influenced and shaped by the cultural work of music. In doing so, I engaged with a variety of disciplines to enrich the discussion, including sound studies, musicology, history, and science and technology studies. I show that music serves as a useful approach to themes of postwar American culture, ranging from technology, race, countercultures, and the importance of online communities. Popular music shapes American cultural history, politics, and artistic movements, and although this study is primarily concerned with music and technology pioneered or consumed in the United States, I hope that the transnational connections are evident.

Pinch and Trocco's description of Moog and Buchla as "boundary shifters" inspired my search for other such examples in music and culture. The work of these two inventors form an integral part of this work, as their technological innovations proved crucial to electronic technology's role in changing music. I wanted to extend their story beyond the 1960s and link sound technology to a larger track of postwar engineering that imagined the world of the future. The synthesizer not only allowed the '60s counterculture to sound a new consciousness, but provided the template for integrated circuits, computer processing, music production models and online life. Much of this new consciousness extends into the discussion of Hendrix, whose own employment of guitar pedals and recording technology promoted an Afrofuturist philosophy of unity that aspired to overcome violence and racial division. While Hendrix's use of noise as an

antiwar statement has been previously discussed, most notably in Waksman's excellent treatment, I provide a unique reading of Hendrix in the recording studio as equally virtuosic behind the stereo mixer as he was on the guitar. In my view, Hendrix emerges as a pioneer in treating recorded sound as a fluid material, which can be further shaped and sculpted to carry a message of social and cultural import. My focus on Nine Inch Nails positions Trent Reznor as an important transitionary figure, using noise politics to challenge conservative politics in his early career and embracing computer technology as a response to corporate control in the formative years of the internet. Finally, Deadmau5 remixes the Reznor model by demonstrating the power of online culture through online social media, fan communities, and virtual world creation that encourages direct artist and fan interaction. His case study also presents the fading delineation in contemporary music between computer-based music production and performance, in which sample-based computer software must be considered as a new instrumentation.

Attali's critical theory provided a framework for choosing specific artists, new technology and historical moments that represent broader cultural change. His argument that subversive noise challenges a controlling order and heralds new social orders, ascribes to music a unique political economy and prescience. Discordant noise, louder volume, and new instruments all serve as markers of disruption that forecast future change. I have used Attali's work to link new sounds and technology to youthful counterculture protest.

A natural break occurs between the Hendrix and Reznor case studies, coinciding with the introduction of the computer. The synthesizer and Hendrix examples still rely on traditional distribution models of the analog past, even if they exhibit a foreshadowing of online culture. Reznor and Deadmau5 represent a new period of social innovation driven by digital computer technology. By promoting fan uploading and sharing, and engaging their audience through social media, both artists have explored the connective qualities of online life. This online philosophy has allowed Reznor and Deadmau5 to independently release music and encourage active audience participation in a financially sustainable model for the artist. An openness toward file-sharing and remix culture indicates how these particular musicians are helping to define common online practices, even if their open models run counter to the music industry's position. They also echo broader movements in social innovation, including, for example, open-source platforms, Bitcoin, and Fair Trade, that may indicate a new political consciousness seeking public good, outside of corporate monopolies, through the democratizing aspects of online information and exchange.

By keeping sound at the forefront of this dissertation, I aim to extend discussions about the cultural implications of musical technology, noise politics, electronic timbre, multitrack audio, digital analytical techniques, and online communities built through social media. I present an interdisciplinary model, keeping with the nature of both American studies and sound studies, as an approach to music studies that combines fields to account for modern production models and online systems. The introduction of new

case studies drawn from popular music, specifically Nine Inch Nails and Deadmau5, provide examples of culturally significant genres that rely extensively on electronic mediation. The application of this type of interdisciplinary study certainly extends to other areas of scholarship or music genres, from gender studies to hip-hop, for example, but also gaming, cybernetics, cognition studies, or the effect of drugs on the musical experience, an area that is only briefly mentioned within this dissertation.

As music continues to evolve within an online platform, a multimedia approach is necessary in future music studies. The fluidity of streaming, tagging, and tweeting dictates that online music culture will move more quickly than previous models. Thinking in terms of "remixing" addresses some of these new concerns as music evolves, self-references, and takes on new meanings in virtual space. Much more research needs to be done on the many of the roles of technology in music production, transmission, and playback. Internet file-sharing, streaming, and remix culture brings into question ideas of intellectual property and ownership. Instruments are continually being redefined by software and new devices, such as the iPad. Smartphone technology and Apps have evolved to the level of facilitating an entire multitrack project that can be instantly uploaded to music-sharing websites, such as Soundcloud, without reliance on a desktop computer or laptop. Music culture has developed a new critical reference from blogging, a running commentary through Twitter, and a visual dimension on YouTube. Online fan cultures continue to engage in new models of interaction and participation with musicians on an increasingly intimate level. Sound and music have also become intertwined with

video game culture, either through soundtracking or music-based games, where players begin to think in terms of a personal avatar that augments their perception of self. As we continue to adapt to the rapid pace of technology and make sense of our virtual lives, music will provide the sounds that inspire the future. It is important that we think critically about its relationship to our culture and keep listening for the next noise.

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